

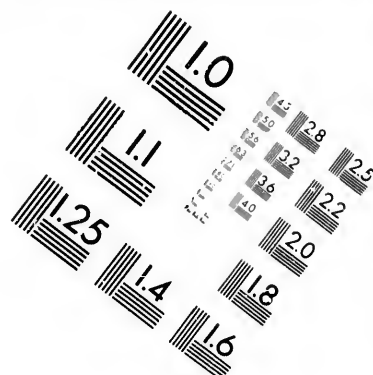
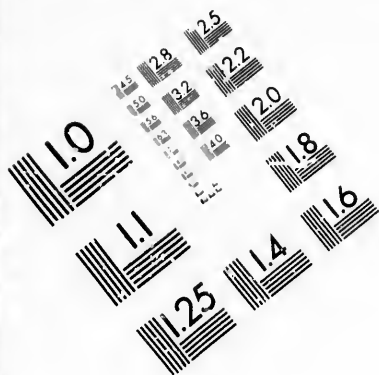
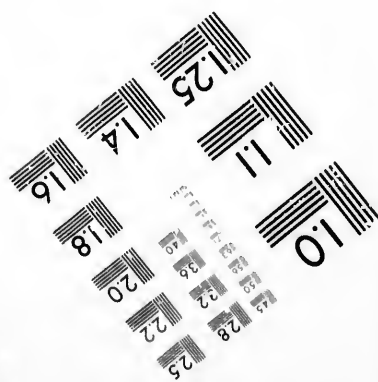
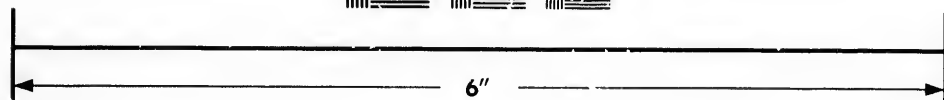
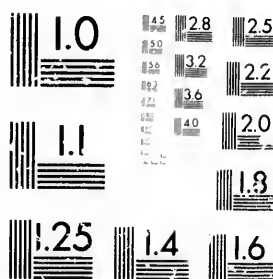


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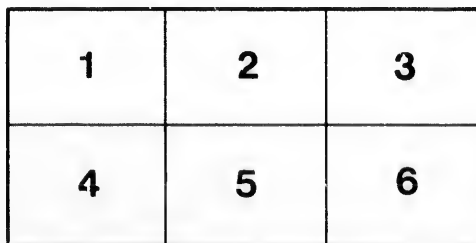
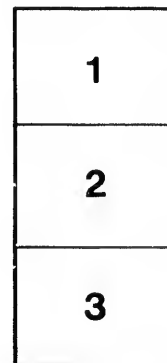
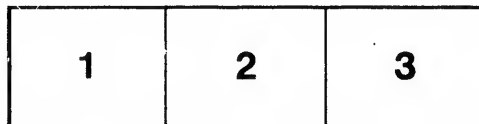
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PROGRESS REPORT

ON THE

CANADIAN PACIFIC RAILWAY

EXPLORATORY SURVEY.

ADDRESSED TO THE HON. H. L. LANGEVIN, C. B., MINISTER OF PUBLIC WORKS.

BY SANDFORD FLEMING,

ENGINEER-IN CHIEF.

OTTAWA, APRIL 10TH, 1872.

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CANADIAN PACIFIC RAILWAY,

OFFICE OF THE ENGINEER IN CHIEF.

Ottawa, 10th April, 1872.

Hon. H. L. LANGEVIN, C. B.

Minister of Public Works,
&c., &c., &c.

SIR,

I have the honor to submit the following preliminary Report on the Canadian Pacific Railway Exploratory Survey, commenced in June last year.

According to the terms upon which British Columbia entered the Dominion of Canada, it became necessary to construct a Railway through to the Pacific coast, from some point which would form a junction with the existing Railway system in the Provinces of Ontario and Quebec.

The first important step towards the construction of the Railway, being to ascertain by instrumental and other examination where a practicable and eligible line could be found, a Survey became necessary.

The Parliament, at the last Session made a grant of money towards the Survey, and the Government subsequently appointed the undersigned to conduct it and to carry into execution such steps as might be considered best, in order to discover the most practicable line for the proposed Railway and obtain information respecting its general Engineering features.

It was deemed important to take such prompt and energetic action as would secure as much information on the subject as possible, before the next meeting of Parliament.

The object of this Report is to give a brief outline of the steps which have been taken to accomplish the desired objects and likewise to present in a concise form, the general results of the Survey, up to the present time.

A point near the River Ottawa, opposite Lake Nipissing was selected as the eastern end of the Survey, this point, named "Mattawa," is common to and easily connected with the Railways, built and projected, in Ontario and Quebec.

The Terminus on the Pacific coast is still an open question; its selection will probably be governed to a considerable extent, by the comparative facilities for Railway construction presented by various projected routes through British Columbia.

At the outset of the enquiry all such information regarding the country extending from Mattawa to the Pacific Coast, as it was possible to obtain, was carefully considered, in order to discover where the surveys should be made with the greatest hope of success.

It was found that the general direction of the Railway Line would be governed, by certain important physical features at various points through the country to be traversed.

Prominently among these may be mentioned; 1st. the very rugged country along the shores of, and for some distance back of Lakes Huron and Superior; 2nd. Lake Nepigon; 3rd. Lake of the Woods; 4th. Lake Manitoba; 5th. The Rocky Mountains, and lastly the Gold, Selkirk and Cascade ranges of mountains in British Columbia.

The leading features of the country naturally divide the survey into three great divisions.

First.—From Mattawa to Fort Garry.

Second.—From Fort Garry to the Rocky Mountains.

Third.—From the Rocky Mountains to the Pacific Coast;

It will be convenient to refer to the subject under these separate heads.

MATTAWA TO FORT GARRY.

Very little information could be obtained respecting a great extent of the country between Mattawa and Fort Garry. It had scarcely been penetrated more than a few miles back of the River Ottawa and the Lakes Huron and Superior, except on the canoe routes which lead to the outlying posts of the Hudson Bay Company. Along the chain of Lakes extending from Fort William to Manitoba, however, its character was better understood.

What was really known of this country, particularly that long stretch between the Ottawa and the northern bend of Lake Superior, indicated that it was not favourable for Railway construction. Along the coast of Lake Superior, the ground was reported most impracticable and forbidding.

It was deemed advisable therefore in projecting a chain of surveys, to make the attempt of piercing through the interior at a considerable distance back from the Lake, in the hope of finding ground free from those serious obstacles which presented themselves on or near the coast.

It was at the same time considered important to make the attempt of finding a practicable line which would touch the navigable waters of Lake Superior, at the nearest point to Fort Garry, viz:—At Nepigon, or Thunder Bay.

The whole distance from Mattawa to Fort Garry was sub-divided into eleven different surveys or divisions, each from 75 to 90 miles in length, with the view of securing a continuous chain of instrumental measurements, with as little delay as possible.

The whole country along the line of projected surveys, embracing an extent of not far short of one thousand miles, being densely wooded and without a road or trail of any description, made the prosecution of the work unusually difficult.

A branch survey was authorized from the Nipissing district to Sault Ste. Marie, to connect with lines projected south of Lake Superior, and with steam boat navigation to Nepigon, or Thunder Bay.

To obtain as much information as possible within the year, an expedition was also sent northerly to James' Bay.

The last named expedition ascended to the head waters of the river Ottawa, and Northerly by the river Abbitibbe to Moose Factory, returning by Moose River and Michipicoten River to Lake Superior.

FORT GARRY TO THE ROCKY MOUNTAINS.

The country west of Fort Garry, consisting, for the most part, of open prairies, and being characterized, even up to the base of the Rocky Mountains, by physical and engineering features, remarkable for their simplicity; a continuous instrumental survey was not for the present deemed necessary.

A careful examination of all the information obtainable, showed, however, that, as a general rule, the rivers of the plains west of Fort Garry, flow in deeply eroded beds of great width, suggestive of Bridging on a gigantic scale.

It was found, chiefly from the reports of the Palliser expedition, that the great troughs or valleys through which the streams flow, range over a wide extent of country, from 150 to 300 feet and even 400 feet in depth under the level plateau on each side; these great river troughs are at the same time reported, not unfrequently to be about a mile and a mile and three quarters in width.

It appeared, therefore, of the utmost importance to examine further into this subject with the view of finding a route for the railway through the central plains as direct as possible, avoiding as far as practicable, the obstacles referred to, or overcoming them at the least difficult points.

A double expedition was organized to proceed by different routes, between Fort Garry and the two most eligible passes through the Rocky Mountains, viz: The Howse Pass and the Yellow Head Pass.

The instructions given this expedition were such as to elicit the desired information.

THE ROCKY MOUNTAINS TO THE PACIFIC.

It appeared from all the information that could be gathered from different sources that, of all the passes through the Rocky Mountains, those named the Howse and the Yellow Head Passes, would prove most eligible for the Railway.

Within the Province of British Columbia other most serious obstacles to Railway construction in any desired direction presented themselves, and the selection not only of one of these Passes, but also of a Terminal point on the Pacific Coast, seemed to depend on the success which might attend any attempt to discover the most practicable line for a railway across the interior of the Province.

The survey in British Columbia was divided into Districts, one between Howse Pass and Shuswap Lake, a second between Shuswap Lake and the Straits of Georgia by the Lower Fraser River, a third between Yellow Head Pass and the Upper Fraser River through the Cariboo country.

Engineers were appointed to conduct the surveys in each of these Districts, and six surveying parties were organized, with the view of thoroughly exploring the country, and gaining information which would lead to the selection of the most eligible line for the Railway.

GENERAL ORGANIZATION OF STAFF.

In a work of such magnitude, beset with difficulties of no ordinary kind and under circumstances which called for as much information as

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possible, with the least possible delay, it was important to organize the staff on a scale and in a manner calculated to secure satisfactory results.

The uninhabited, trackless and seemingly impenetrable nature of a great deal of the country to be explored, rendered it the more important that every means should be taken to prevent failure in obtaining the information sought for, or disaster to any of the parties engaged on the several branches of the survey.

A Commissariat Department was organized to attend to all matters connected with the procuring and transportation of supplies.

As far as it was possible or expedient, a uniform system was instituted for operations in the field and for recording information obtained.

General and special instructions were drawn up for the guidance of every member of the staff.

To simplify correspondence and lessen the chances of mistakes in connection with the Commissariat Department and also for easy general reference, the several divisions of the Survey were designated by letters of the alphabet and as reference will frequently be made to them in the detail Reports which accompany this, the following explanation is here presented :

Division **B**. Extending from Mattawa to the confluence of the Montreal and Ottawa Rivers.

Division **C** Extending from the Ottawa to a point near the head of the Montreal River.

Division **D**. From the Montreal River to a point about midway to the west branch of Moose River

Division **E**. From the last named point to Moose River.

Division **F**. From Moose River to Small Black River, north of Lake Superior.

Division **G**. From Small Black River to Long Lake.

Division **H**. From Long Lake to Red Rock, at mouth of Nepigon River.

Division **I**. From Red Rock to Lac des Iles.

Division **K**. From Lac des Iles to the canoe route to Lac Seul.

Division **L**. From Canoe Route to Lac Seul, to White Fish Bay, Lake of the Woods.

Division **M**. From White Fish Bay to Red River, near Fort Garry.

Division **N**. Expedition northerly by rivers Ottawa. Abbitibbe, Michipicoten and Moose, to James' Bay.

Division **O.** } Expedition to examine the country west of Fort Garry
 Division **P.** } to Kootanie Plain, near the Howse Pass, and Jasper House,
 near the Yellow Head Pass.

Division **Q.** Between the North Thompson and Yellow Head Pass.

Division **R.** Between Cariboo and Tête Jaune Cache.

Division **S.** Between the Columbia River and Howse Pass.

Division **T.** The Eagle Pass between Shuswap Lake and the River
 Columbia.

Division **U.** Between Lytton, on Fraser River and Shuswap Lake.

Division **V.** From Lytton Southerly toward Burrards Inlet.

Division **W.** From Sault Ste. Marie along the North Shore of Lake Huron
 to French River.

As rapidly as the various parties were organized and Commissariat
 arrangements made, they began to move forward each to their respective
 field of operations.

The total number of Engineers, Surveyors, Levellers and assistants
 employed, together with axemen, beatmen, packers, &c., would not be far
 short of eight hundred.

The first detachment left by the River Ottawa for the interior on the
 10th of June. Those for the region north of Lake Superior left Colling-
 wood on the 20th June. In British Columbia, a portion of the staff left
 Victoria for the Mountains on the 20th of July. *

PROGRESS OF THE SURVEY.

Some general observations respecting the progress made in the prose-
 cution of the survey, may now be submitted.

Full detail information, may be had on reference to the reports and
 documents which accompany this.

It has been found impossible to maintain regular communication with
 many of the parties engaged on the survey during the winter, but judging
 from the Progress Reports last received, the undersigned feels confident in
 stating that the surveys projected in June last between Mattawa on
 the Ottawa and Nepigon Bay on Lake Superior are now, with one ex-
 ception, completed and that only two breaks in the survey exist between
 Nepigon Bay and Fort Garry.

No serious engineering difficulty has been met with in passing from the
 Valley of the Ottawa to the country north of Lake Superior; it is impossible,

* The day on which British Columbia entered the Dominion.

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however, to speak so favourably of the country covered by Divisions **G** and **H** of the survey, embracing over one hundred miles easterly from the River Nepigon. This section is excessively rough and mountainous, and the survey made through it, did not result in finding a practicable line for the Railway.

West, from Nepigon River to Fort Garry, although two Divisions of the Survey are incomplete, enough is now known of the country to warrant the belief that it will admit of a practicable line with favourable grades for the greater part of the distance.

Explorations are now being made with the view of ascertaining how far it may be practicable to avoid the very serious difficulties referred to on Divisions **G** and **H**, by running the Railway Line further in the interior; it has already been found that the rocky and broken country, which presents itself on the shore of Lake Superior, changes very much at a distance of 50 or 60 miles to the north, and from what has been learned it is thought that a perfectly practicable Line will be discovered by the north side of Lake Nepigon. Definite information on this point cannot be received before navigation opens between Collingwood and Lake Superior, when the parties engaged on the exploration are expected to return, but the Line drawn on the map by the north side of Lake Nepigon shows the general direction in which, from the very latest information received, a practicable and favorable Line may be confidently expected.

The survey and exploration made from Sault Ste. Marie easterly along the northern shore of the Georgian Bay towards Lake Nipissing, establish the fact that a good Line can be had with very favorable grades.

The expedition to James Bay had no difficulty in passing from the River Ottawa northerly to tide water at the mouth of the Abbitibbe, and in returning to Lake Superior by Moose River. The Report, which accompanies this, furnishes some interesting information.

The Expeditions sent out to examine several projected routes across the Plains west of Fort Garry, and extending up to the Towse Pass on the one hand, and the Yellow Head Pass on the other, have returned after accomplishing the service satisfactorily.

The information thus derived shows that on some of the routes, the cost of carrying the Railway across the River Valleys would be very great, but that a comparatively favourable route in this respect as well as in others, may be had by following the general direction shown on the accompanying Map. This route, which from all present information, appears likely to prove the most favorable, is shown on the Map by a Line drawn from a crossing of the Red River, north of Fort Garry by Dauphin

Lake, Swan River, the elbow of the North Saskatchewan, Battle River, Beaver Lake, and thence via the Jasper House to the Yellow Head Pass. On some other routes it was found that the great Rivers flowed in troughs, enormously deep and wide; but the line drawn on the Map appears from all the information obtained to involve the least amount of Bridging, while at the same time it passes through or near the most available country for settlement; the South Saskatchewan can be crossed on this Line by a bridge, 1,400 feet long, not exceeding sixty feet in height above water level, and about 70 feet above the bed of the River at the deepest point. There will probably be even less difficulty in spanning the North Saskatchewan, and as these are the largest rivers to be crossed on the Line laid down, the comparatively favorable points for crossing them, which have been found, is considered extremely fortunate, considering the general features of the great water channels in this wide extent of country.

With regard to the Survey between the Rocky Mountains and the Pacific Coast, although a great deal still remains to be done, material progress has undoubtedly been made.

A very favorable line for a railway has been found through the Gold Range by the Eagle Pass, extending from Little Dalles on the Columbia River to Great Shuswap Lake, and an Instrumental survey has been completed from the foot of the last named Lake to Hope on the Lower Fraser River. The general engineering features of the approaches to Howse Pass, have also been ascertained.

The surveying expedition which left Victoria on the 20th July to find a moderately direct line from Quesnel Mouth, through the Cariboo country to Tête Jaune Cache, has failed in its object. The lowest pass discovered through the Selkirk range, although about 1000 feet lower than the mountains adjoining is reported to be at such an elevation, that the ground falls on one side 1600 feet in five miles and on the other 2300 feet in about six miles, thus proving the pass impracticable for a Railway, unless with a Tunnel at an enormous cost.

A favourable pass from the North Fraser River in the neighborhood of Tête Jaune Cache, to the north branch of the Thompson River has been found.

According to the information received, this will admit of a line being constructed from Yellow Head Pass to Kamloops, with grades not exceeding 50 feet per mile.

The fortunate discovery of a practicable line with grades so favorable, between Kamloops and the summit of the Rocky Mountains, *via* the north Thompson and Yellow Head Pass, together with information received

from the expedition, which examined the country on the eastern slope of the mountains, led to the abandonment of all farther work on the survey *via* Howse Pass.

Kamloops is an important point on the line which was being surveyed from New Westminster through the Eagle Pass to Howse Pass. The distance from Kamloops to a common point near Edmonton House, is not greater by the North Thompson and Yellow Head Pass, than it is by Eagle and Howse Pass, while all information goes to show that a very much better and less costly line can be had by the former than by the latter route.

Finding that Kamloops could be easier reached from the eastern slope of the Rocky Mountains by the Yellow Head than by the Howse Pass, there was no longer any object in continuing operations east of Kamloops on the latter route.

This led to the adoption by the Government on the 2nd inst., of the Yellow Head Pass as the *gate* to British Columbia from the east.

The adoption of the Yellow Head Pass has greatly simplified the Survey, and now the efforts of the whole staff in British Columbia, are concentrated on lines leading to one common point, viz: Tête Jaune Cache, in about longitude 120° and latitude 53° . It being impossible to reach the Pass selected through the Rocky Mountains from the west, without first touching the River Fraser at this point.

The next important consideration is the establishment of the Railway route from Tête Jaune Cache, to the Pacific coast.

It has already been mentioned that there will be no difficulty in building a railway with very favourable grades from Tête Jaune Cache to Kamloops. From Kamloops a survey has been made to Burrards Inlet (the harbour of New Westminster) except about seventy miles on the extreme western end of the line, and on the latter section no serious difficulties are believed to exist. This survey shows that a practicable line with favorable grades may be had, although the cost, particularly along the *canons* of the lower Fraser River, will be considerably above an average.

The Harbour of Esquimaux, near Victoria on Vancouver's Island, is strongly advocated by some as the point where the Railway should terminate. To reach Esquimaux without break, it will be necessary to bridge the Straits of Georgia in the neighborhood of Valdes Island where the channel is narrowest, and the question of bridging can only be settled by careful surveys now ordered.

Assuming that it may be found practicable to form a bridge connection between Vancouver's Island and the mainland, the physical formation

of the country will render it necessary to carry the line along by Bute Inlet. It is important, therefore, to ascertain how Bute Inlet can be easiest reached from Tête Jaune Cache.

Although the attempt made last year to find a short line across the Cariboo country in the required direction proved unsuccessful, all farther efforts have not been abandoned. The work of exploration has been carried on during the winter and a diligent search will be continued wherever success is at all possible. Some hopes are entertained that a line may be found from the North Thompson across the Selkirk Range to the Quesnel Lakes and thence *via* Quesnel mouth to Bute Inlet, but should this fail, a careful examination will be made about fifty miles farther to the south on a line projected through by Horse Lake and Lake La Hache. Should all these explorations prove failures, it is confidently believed that it will be quite possible to reach Bute Inlet by a practicable line from Tête Jaune Cache, going round the Cariboo country on the north side along the banks of the Fraser River, and thence across the Chilcotin plains. The only serious objection to the latter route will be its length. The gradients can scarcely fail to be favorable on account of the line following the river for over 250 miles on a uniform and gradual descent.

Besides Burrards Inlet and Esquimault, other harbours accessible from the Pacific have been spoken of for the terminus. Of these may be mentioned Alberni at the head of Barclay Sound, another harbour at Nootka Sound, Bentick Arm, also Port Essington, or some suitable point at the mouth of the Skeena River. It is somewhat premature, however, to discuss the merits of any of these points without further information respecting the means of reaching them from Tête Jaune Cache.

In concluding a summary of what has been accomplished since the survey was instituted in June last, it is greatly to be regretted that more definite information has not yet been received respecting the explorations now in progress east and west of Lake Nepigon, in the rear of the rugged belt along Lake Superior.

Assuming however, and enough it is believed is known to warrant the assumption, that all difficulties in this quarter will be obviated, it may be claimed that the practicability and the general direction of the Railway Line from Ottawa to Fort Garry, thence across the great plains and the Rocky Mountains to Tête Jaune Cache has approximately been determined, and that from the last named point at least one line to the waters of the Pacific Ocean has been found practicable.

It will be interesting to compare some of the features of the line re-

ferred to in the last paragraph with the Union Pacific Railway in the United States, for this purpose a diagram accompanies this, showing thereon profiles of both.

From this diagram it will be seen that the Union Pacific Railway* extending from Omaha to San Francisco, runs, for 1,300 miles or three-fourths of its entire length, at a higher level than the Yellow Head Pass, and that this point, the *great summit* of the Canadian Pacific Railway line, is less than half the elevation attained at several points on the line now being operated across the Continent.

A Table giving the distances between some of the principal points in the country extending from the Ottawa Valley to the Pacific coast is appended hereto. It is not to be supposed that this Table has any great pretensions to accuracy, except in the case of Railways built or surveyed, in other cases the distances are simply ascertained by measurement on the maps of the country, and it is not at all certain that even the best maps are free from grave errors. Be this as it may, there are no means of checking the distances, until the chain of surveys are connected from end to end and the results known. It is believed, however, that even rough approximate distances may be useful to the Government in considering the question of the Railway, and for this purpose they are presented.

One or two points brought out by the Table of Comparative distances are worthy of note.

Montreal and Toronto are the chief Commercial centres in the Provinces of Quebec and Ontario, and it is important to ascertain how they can best be reached from a point in the Interior—say Fort Garry.

According to the Table, the distance between Montreal and Fort Garry by the line of the Canadian Pacific Railway, is 1,180 miles, while by Railway projected through Sault Ste. Marie, Duluth and Pembina, the distance is 1,440 miles, and by way of Chicago and St. Paul, the distance is 1,843 miles—showing that by the three *all-rail* routes, made or projected between Fort Garry and Montreal, the Canadian Pacific line is 260 miles shorter than the line passing through Sault Ste. Marie, and 663 miles shorter than the route at present travelled *via* Chicago and St. Paul.

Taking Toronto as a starting point, and using the Northern or Nipissing Railways as far as Bracebridge, thence connecting them with the Canadian Pacific Railway at Mattawa, it appears from the Table that the total distance to Fort Garry is 1,110 miles, while by way of Bracebridge, Sault Ste. Marie, Duluth and Pembina, the distance is 1,290 miles, and by way of Chicago and St. Paul the distance is 1,507 miles, thus establishing

*Embracing the Central Pacific Railway.

the fact, that of the three *all-rail* routes made or projected between Fort Garry and Toronto, the Canadian Pacific is 170 miles shorter than the route *via* Sault Ste. Marie and Duluth, and close on 400 miles less than the Railway route *via* Chicago and St. Paul.

It will be farther seen that, during the season of open navigation, the distance between Toronto and Fort Garry *via* Nepigon, is 1,074 against 1274 miles *via* Duluth and that part of the Northern Pacific Railway east of Pembina—giving a saving of 200 miles in favour of the Canadian Pacific, and branch to Nepigon, of which saving 40 miles is rail and 160 miles water.

Viewing the Canadian Pacific Railway as a “through” route between Ports on the Atlantic and Pacific Oceans, the comparative Profile referred to in a previous paragraph, and which accompanies this, illustrates the remarkable engineering advantages which it possesses over the Union Pacific Railway. The lower altitudes to be reached, and the more favorable gradients, are not, however, the only advantages.

A careful examination into the question of distances, shows, beyond dispute, that the Continent can be spanned by a much shorter line on Canadian soil than by the existing railway through the United States.

Referring to the Table again, it will be seen that the distance from San Francisco to New York, by the Union Pacific Railway, is 3,363 miles, while from New Westminster to Montreal it is only 2,730 or 633 miles in favor of the Canadian route.

A closer examination of the Table will show that by the construction of the Canadian Pacific Railway, even New York, Boston and Portland will be brought from 300 to 500 miles nearer the Pacific coast than they are at present.

A comparison of distance between distant points which may form traffic connections with the Inter-Oceanic Railways of North America, bring out some important facts referred to in the Table.

Compared with the Union Pacific Railway, the Canadian Line will shorten the passage between Liverpool and China, in direct distance, more than one thousand miles.

When the remarkable Engineering advantages which appear to be obtainable on the Canadian Line and the very great reduction in mileage above referred to are taken into consideration, it is evident that the Canadian Pacific Railway, in entering into competition for the Through Traffic between the two Oceans, will possess in a very high degree the essential elements of success

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It has been found impossible to make any comparison with the Northern Pacific Railway, projected through the Territories of the United States to Puget Sound, as no reliable information could be obtained respecting distances, gradients, elevations, or probable route, except on that portion of the undertaking east of the Red River.

In concluding this Report it may not be out of place to remark that a Survey of such magnitude through a country for the most part uninhabited and destitute of the means of shelter or subsistence could not be prosecuted without encountering risks and hardships to the individuals engaged.

The serious responsibility of keeping all the various parties properly supplied with at least common necessities of food was fully appreciated from the beginning, and although supplies may, in isolated cases, have run short, no actual suffering from want has been reported.

It greatly grieves me to report the loss of seven poor men, who perished last summer through forest fires while engaged in carrying provisions to one of the surveying parties north of Lake Superior.

No other very serious disaster has occurred, although several narrow escapes have been met with. Since the winter set in several men have been badly frozen.

It is impossible to speak too highly of the courage and endurance displayed by members of the Staff, more especially of those who, in order to carry out the wishes of the Government with as little delay as possible, did not hesitate, after the summer's campaign had terminated, to remain out on the exploration during the winter.

Some of these parties have been out for nearly ten consecutive months embracing the whole of winter with all its severity. The service under the circumstances of country and climate could not fail to be a very severe one. It was impossible to supply them adequately with shelter or change of diet, in consequence of which several painful cases of scurvy have resulted.

All hardships and deprivations have, however, been braved and endured in a manner deserving of the highest commendation.

It is extremely gratifying to be able to report that with very few exceptions all the members of the Staff, including those engaged in the Commissariat Branch, entered on their several duties with great zeal, and exerted themselves in every possible way to bring the work to a successful issue.

It is due to the Officers of the Hudson Bay Company to state that wherever they were met with, they extended to the parties engaged on the survey much very acceptable kindness and assistance.

The Indians along the whole route proved remarkably friendly, when the nature and objects of the several expeditions were explained to them. Many of them rendered valuable service in various ways, in connection with the work of exploration.

I have the honor to be,

Sir,

Your Obedient Servant,

SANDFORD FLEMING,

Engineer-in-Chief.

APPENDIX No. 1.

TABLE OF APPROXIMATE DISTANCES.

Canadian Pacific Railway, as projected on Plan.

(See explanation, page 10 of Report.)

	NAMES OF PLACES.	Intermediate distances.		Total Distances.
		Miles.	Miles.	
	Mattawa to junction of Nipigon branch.....	580		
	Junction of Nipigon branch to Fort Garry.....	320		
	Mattawa to Fort Garry		900	
	Nipigon branch.....	120		
	Fort Garry to Jasper House.....		1000	
	Jasper House to Yellow Head Pass.....	40		
	Yellow Head Pass to Tête Jaune Cache.....	60		
	Jasper House to Tête Jaune Cache.....		100	
	Mattawa to Tête Jaune Cache.....		2000	
	Tête Jaune Cache to New Westminster (Burrard Inlet) via Kamloops and line under Survey.....		450	
1	Mattawa to New Westminster			2,450
	Mattawa to Tête Jaune Cache (as above).....		2,000	
	Tête Jaune Cache to Bute Inlet, via North Thompson and Lac la Hache.....		450	
2	Mattawa to Bute Inlet.....			2,450
	Mattawa to Tête Jaune Cache (as above).....		2,000	
	Tête Jaune Cache to Bute Inlet, via North Fraser River and Forts George and Chilcotin.....		450	
3	Mattawa to Bute Inlet			2,450
	Mattawa to Bute Inlet (as above).....		2,450	
	Bute Inlet to Alberni Canal (Barclay Sound).....		150	
4	Mattawa to Alberni Canal.....			2,600
	Mattawa to Bute Inlet, (as above).....		2,450	
	Bute Inlet to Victoria, (Esquimaux Harbor).....		250	
5	Mattawa to Victoria.....			2,700
	Mattawa to Tête Jaune Cache (as above).....		2,000	
	Tête Jaune Cache to Port Essington, via North Fraser River.....		500	
6	Mattawa to Port Essington.....			2,500

COMPARATIVE DISTANCES.

Names of places between Montreal, Toronto and Fort Garry.		Rail or Water.	Inter- mediate Distance	Total Dis- tance.
			Miles.	Miles.
Montreal to Mattawa.....		Rail.	280	
Mattawa to Fort Garry (Canadian Pacific).....		do	900	
1 Montreal to Fort Garry (via MATTAWA).....				1,180
Montreal to Mattawa.....		do	280	
Mattawa to Sault Ste. Marie.....		do	280	
Sault Ste. Marie to Nipigon.....		Water.	260	
Nipigon to Fort Garry (Canadian Pacific).....		Rail.	440	
2 Montreal to Fort Garry (via MATTAWA, SAULT, and NIPIGON).....				1,260
Montreal to Mattawa.....		Rail.	280	
Mattawa to Sault Ste. Marie.....		do	280	
Sault Ste. Marie to Duluth.....		R. or W.	400	
Duluth to Moorhead.....		Rail.	243	
Moorhead to Fort Garry.....		do	237	
3 Montreal to Fort Garry (via MATTAWA, SAULT, DULUTH, and MOORHEAD).....				1,440
Montreal to Chicago.....		Rail.	848	
Chicago to St. Paul.....		do	491	
St. Paul to Fort Garry.....		do	501	
4 Montreal to Fort Garry (via CHICAGO and ST. PAUL).....				1,840
Montreal to Toronto.....		Rail.	333	
Toronto to Collingwood.....		do	94	
Collingwood to Nipigon.....		Water.	540	
Nipigon to Fort Garry (Canadian Pacific).....		Rail.	440	
5 Montreal to Fort Garry (via TORONTO, COLLINGWOOD, and NIPIGON).....				1,407
Toronto to Bracebridge (via Northern and Toronto and Nipissing Railway).....		Rail.	130	
Bracebridge to Mattawa.....		do	80	
Mattawa to Fort Garry (Canadian Pacific).....		do	900	
6 Toronto to Fort Garry (via BRACEBRIDGE and MATTAWA).....				1,110
Toronto to Bracebridge.....		Rail.	130	
Bracebridge to Sault Ste. Marie.....		do	280	
Sault Ste. Marie to Nipigon.....		Water.	260	
Nipigon to Fort Garry (Canadian Pacific).....		Rail.	440	
7 Toronto to Fort Garry (via BRACEBRIDGE, SAULT, and NIPIGON).....				1,110
Toronto to Bracebridge.....		Rail.	130	
Bracebridge to Sault Ste. Marie.....		do	280	
Sault Ste. Marie to Duluth.....		R. or W.	400	
Duluth to Moorhead.....		Rail.	243	
Moorhead to Fort Garry.....		do	237	
8 Toronto to Fort Garry (via BRACEBRIDGE, SAULT, DULUTH, and MOORHEAD).....				1,290
Toronto to Chicago.....		Rail.	512	
Chicago to St. Paul.....		do	491	
St. Paul to Breckenridge.....		do	217	
Breckenridge to Fort Garry.....			287	
9 Toronto to Fort Garry (via CHICAGO and ST. PAUL).....				1,507
Toronto to Collingwood.....		Rail.	94	
Collingwood to Nipigon.....		Water.	540	
Nipigon to Fort Garry (Canadian Pacific).....		Rail.	440	
10 Toronto to Fort Garry (via COLLINGWOOD and NIPIGON, and Canadian Pacific).....				1,074
Toronto to Collingwood.....		Rail.	94	
Collingwood to Duluth.....		Water.	500	
Duluth to Moorhead.....		Rail.	243	
Moorhead to Fort Garry.....		do	237	
Toronto to Fort Garry (via COLLINGWOOD, DULUTH, and MOORHEAD).....				1,274
11 Fort Garry to Duluth (Railway made or projected).....			480	
Fort Garry to Nipigon (Canadian Pacific, Main Line and Branch).....			440	

NOTE.—Where ever Fort Garry is mentioned in the above distances, the lower Fort Garry or Stone Fort, is the place meant; this being found the most eligible point for crossing Red River.

COMPARATIVE DISTANCES.

Description of Route between Atlantic and Pacific Ocean Ports.		Miles.
1	San Francisco to New York.—Union Pacific, Michigan Central and New York Central.....	3,363
	New Westminster to Montreal.—Canadian Pacific, and Line to Montreal via Ottawa.....	2,730
	Difference in favour of Canadian Route.....	633
2	San Francisco to New York.—Union Pacific, Michigan Central and New York Central.....	3,363
	New Westminster to New York.—Canadian Pacific, St. Lawrence & Ottawa.....	3,058
	Ogdensburg & Rome, and New York Central.....	305
	Difference in favour of Canadian Route.....	305
3	San Francisco to Montreal.—Union Pacific, Michigan Central, Grand Trunk Railway.....	3,251
	New Westminster to Montreal.—Canadian Pacific, Montreal & Ottawa.....	2,730
	Difference in favour of Canadian Route.....	521
4	San Francisco to Boston.—Union Pacific, Michigan Central, New York Central, to Troy, Troy to Boston.....	3,422
	New Westminster to Boston.—Canadian Pacific, Ottawa to Montreal, Montreal to Boston.....	3,087
	Difference in favour of Canadian Route.....	335
5	San Francisco to Portland.—Union Pacific, Michigan Central, Grand Trunk Railway.....	3,548
	Westminster to Portland.—Canadian Pacific, Ottawa & Montreal, Grand Trunk Railway.....	3,027
	Difference in favour of Canadian Route.....	521

NOTE.—The distance from Japan, China or the Asiatic Coast generally, to Liverpool is from 1,000 to 1,200 miles less by the Canadian Pacific than by the Union Pacific Railway. In reference to this point Professor Maury, U. S., writes :—"The trade-winds place Vancouver's Island on the way side of the road from China and Japan to San Francisco so completely that a trading vessel under canvas to the latter place would take the same route as if she was bound for Vancouver's Island—so that all return cargoes would naturally come there in order to save two or three weeks, besides risk and expense." It must, however, be clearly understood that this advantage equivalent to the distance between Vancouver Island and San Francisco, viz. about 800 miles, is independent of and in addition to the saving of direct distance, by the Canadian Route, given above.

LATITUDES AND LONGITUDES.

NEW YORK.....	{ Lat. 40°—42°—42' N.
	{ Lon. 71°—00°—00' W.
MONTREAL.....	{ Lat. 45°—36°—17' N.
	{ Lon. 73°—58°—30' W.
SAN FRANCISCO.....	{ Lat. 37°—49°—12' N.
	{ Lon. 122°—30°—12' W.
NEW WESTMINSTER.....	{ Lat. 49°—13°—00' N.
	{ Lon. 122°—51°—30' W.

APPENDIX No. 2.

VICTORIA, BRITISH COLUMBIA,

21st March, 1872.

SANDFORD FLEMING, Esq., Engineer-in-Chief, C.P.R., Ottawa.

SIR,—I have the honor to forward you a report of my proceedings since the 29th of last July, on which day I received your letter of June 24th, appointing me to the direction of the surveys to be made in connection with a railway through Canada to the Pacific coast, in the district lying between the mouth of Eagle River, emptying into the Great Shuswap Lake and the Lower Fraser River.

Unfortunately, at the time of my return from the Great Bend of the Fraser, Mr. Watt, the gentleman appointed to act as Commissariat officer and Paymaster, and whom you directed me to confer with respecting all necessary outfit and expenses, was absent from Victoria with Mr. McLennan's parties, and did not return until the 19th of August. Having had no opportunity of consulting with him, or with Mr. Moberly and Mr. McLennan, whom I met for a few minutes only on their way up country, I was unable to move so actively in organizing parties to commence work as I could have wished. The time, however, was not altogether lost, as it enabled me to collect the necessary material with which to form my two parties—a work of very considerable difficulty, as nearly all the professional gentlemen available in the colony were already engaged on the survey.

Knowing how small a portion of the autumn there was remaining suitable for field operations, and how desirable it was to obtain as much information as possible before the close of the year, I judged it advisable to commence work at the nearest point; more particularly as it would embrace the *canons* of the Fraser and Thompson Rivers, which present the most serious obstacles to the construction of a railway.

Having completed my preparations, I left Victoria on Tuesday the 5th September, and reached Yale (the head of the steamboat navigation on the Lower Fraser, and distant from New Westminster by the river about ninety-five miles) on the following Thursday, the 7th September. From this point I detached Mr. Hurd (whom I had placed in charge of the U party) to Lytton, at the confluence of the Fraser and Thompson Rivers, and distant fifty-seven miles by the waggon-road from Yale; with instructions to form a camp near that place, and survey up the left bank of the Thompson towards Eagle Pass.

I moved the V party out to camp on Saturday, the 9th September, and Mr. Homfray, who had been left behind when we started from Victoria, having arrived at Yale on Sunday, I placed the party in his charge with directions to survey up the river to Lytton. On Monday I went over a portion of the line with him, and selected the toll gate near Yale as the initial point from which to commence the survey, directing him to keep as near as practicable on a suitable grade for the railway.

The following morning, after seeing them commence work, I drove to Lytton, and found Mr. Hurd had arrived with his party the day before, and had formed a camp about two miles above Lytton. The next day, Wednesday, 13th September, I spent going over the line with Mr. Hurd, determined on the Court House at Lytton for the starting point, and the following day the party commenced work.

I remained with them two days, advising Mr. Hurd as to the course of the line, until Mr. Watt arrived, when I accompanied him to Kamloops, where he purchased a train of twenty-six animals for the use of the U party in moving their camp, etc.

I reached Kamloops on Wednesday, having taken the opportunity to come up the lake in a canoe, so as to be better able to judge of the nature of its shores. The horse trail by which I had always previously travelled takes back from the lake soon after leaving Savana's Ferry, and follows over very high ground in order to avoid the great Bluff above Cherry Creek, which rises nearly perpendicularly from the waters edge to a height of about eleven hundred and thirty (1,130) feet above the lake. This bluff is about one and three quarter ($1\frac{3}{4}$) mile in length, and presents a very serious obstacle to the construction of a railway.

After purchasing and despatching the pack train to Lytton, I started the next day, Saturday, September 23rd, to make an exploration of the contry between the head of the Little Shuswap Lake and the mouth of the Eagle Pass, the result of which was entirely satisfactory, as I found that the line could be taken by either of two valleys to the south west or Salmon river arm of the Great Shuswap Lake, thus avoiding a long detour of many miles along the shore of the lake, which will at once be seen on referring to the map. The first line leaves the little Shuswap Lake, at its head, and follows a valley through which an Indian horse-trail runs to the Okanagan, with a general course to the south-east. By the second line the south-shore of the Great Shuswap Lake would be followed for about four or five miles from its outlet, when the line would leave it, and running a little east of south, would gain the Salmon river arm at the same point as the first. The distance by the first line is shorter, but the height to be surmounted would be somewhat greater than that by the second line. I could not place much reliance, however, on the barometer, as the weather was very stormy and changeable. On resuming work I intend to run a level from the Little Lake to the summit of the first Pass; and should I find the ascent too heavy, I shall continue on to the Great

Lake, and run the line through the second valley to the Salmon river arm.

From the mouth of Salmon River I continued along the shore of the lake, which is much easier than I had anticipated, to the Shickamouse Narrows near the mouth of Eagle River, where Mr. Moberley's district commences.

The Narrows is a shallow channel connecting the two lakes, and about three hundred (300) feet in width. The bottom is composed of sand and gravel, and the Indians have a fish-weir across it. The depth at the time I was there could not have been more than four or five feet. After spending some days in examining the country in that neighborhood, I returned by way of Salmon River and Nicola Lake to Spence's Bridge (by which the Cariboo waggon road crosses the Thompson River twenty-three miles above Lytton), arriving there on the evening of Sunday the 15th October.

I cannot help thinking that a better and certainly a much shorter line for a railway can be obtained by way of Nicola Lake to Hope, than the one surveyed last Autumn by the Thompson and Fraser Valleys; and I will here quote what I wrote to you in my letter of the 4th November last, in reference to this subject:—"This route from Eagle Pass, by way of Salmon River and Nicola Lake, offers great facilities for the construction of a railway. The gradients would be very easy, and there are no heavy bluffs to be encountered. A saving of from forty to fifty miles in distance would also be effected, should any pass through the Cascade range be found by which to connect Nicola Lake directly with Hope, and all the difficulties of the *canons* of the Thompson and Fraser Rivers would be avoided. Unfortunately the lateness of the season precluded the possibility of my attempting any exploration of these mountains during the present year, but I consider it highly desirable that they should be examined next summer. The chief difficulty would be in descending to Hope, as Nicola Lake is nearly two thousand (2,000) feet above the sea."

On my arriving at Spence's Bridge, I found that the W party had passed some days before, and were then camped about twelve miles above, on the left bank of the river. The next day I rode out to their camp, and finding that they were getting on satisfactorily with the line, I left them the following day, and travelled to Lytton, where I learned that the party had already returned to Yale, after completing the survey to place. I therefore proceeded on and reached Yale on the 19th October, when I found that the party had arrived, and were preparing to survey from Yale towards Burrard Inlet. After seeing them commence work I started for Victoria for the purpose of obtaining several articles of which the party was in need, and arrived here on Wednesday, October 25th. Remaining over one steamer, I left again on the following Tuesday, and joined Mr. Homfray's party on Friday, November 3rd, at the "Sisters Rocks," some ten miles below Yale, where I found them encamped, the line having previously been brought down to that point.

The weather, which had hitherto been fine, now became very wet and stormy, and greatly retarded the progress of the survey. Deeming it of the utmost importance, however, that as much information as possible should be obtained before closing operations for the season, I determined to continue the party at work for some time longer, although at considerable disadvantage, giving Mr. Homfray directions to break up the camp and return with his party to Victoria, when he found it useless to continue longer in the field.

Leaving Yale on Monday, November 5th, I reached Mr. Hurd's camp on Kamloops Lake, near the mouth of Cherry Creek, on Friday, the 9th, and found that the party had just completed the survey to that point. I spent that afternoon in company with Mr. Hurd in examining the Great Bluff; and the next day we started to run the line over the crest of it, as we found it would be quite impossible to keep near the water's edge, the bluff in some places being precipitous. The following day, (Sunday,) it was bitterly cold, with driving snow; Monday was the same, so that the party was unable to move out of camp. The winter had now set in, and considerably earlier than usual; but, in ignorance of this fact and in hopes that the weather would moderate every day, the party continued at work, and eventually succeeded in reaching the foot of the Great Shuswap Lake on December 4th, thus fulfilling the instructions I had given them, and accomplishing the object I had in view, viz.:—to obtain a section from Lytton to the Great Shuswap Lake.

After accompanying the party twenty miles beyond Kamloops, I left them and returned to that place on November 27th, when I made arrangements to winter the pack-train, and store the balance of the supplies, camp equipage, &c., on the return of the party. I left Kamloops on the 1st December, (at which time the Indians were crossing horses over the Thompson on the ice,) and reached Cornwall's, on the waggon-road the next day, when I engaged with him to send his waggon to Savana's Ferry, and bring the party down to Lytton. On the morning of the 3rd December, the thermometer at this place (Ashcroft) stood at 20° below zero. I reached Lytton on the 4th December, and Yale on the 7th, the travelling being very bad from the quantity of snow and ice on the road.

On my arrival at Yale, I found that Mr. Homfray had not yet returned to Victoria, having gone into winter quarters at Hope, some three weeks previously, with all its party. The following morning I started early in a canoe, and, calling at Hope, gave Mr. Homfray strict injunctions to store all his provisions, &c., and bring his party down without further loss of time to Victoria. The same night I reached New Westminster, where I was detained three days waiting for the steamer, and finally reached Victoria on December 12th. Mr. Homfray arrived with the V party on the 16th, when the men were immediately paid off; and Mr. Hurd with the U party, on the following Saturday, December 20th, when his party was also paid off and discharged.

Having thus given you an account of the operations for the season, of the two parties in the field, I may here state that the result of their work may be considered satisfactory, since it has established the fact that an easy grade can be obtained from the Pacific Ocean to the mouth of Eagle Pass; and the surveys made by Mr. Moberly's parties by the valley of Eagle River, across the gold range to the Big Eddy of the Columbia, and from the mouth of Blaeberry River, through Howse Pass to the Kootani Plain, on the east side of the Rocky Mountains, prove that these two formidable mountain ranges can be crossed with much less difficulty than had hitherto been believed possible.

Although the V party was unable, in consequence of the earliness and severity of the winter, to reach tide-water, as I had one time hoped they would be able to do, the section is not in any way materially affected as the survey has been brought through the Cascade Range to the wide open valley of the Lower Fraser, and the fall from the closing part of their work, estimated by barometrical observations, is only 232½ feet, distributed over a distance of sixty-nine (69) miles. There is still, however, a good deal of work to be done to reach the sea from Hope, as the line will have to be carefully explored in order to avoid numerous sloughs, and ground overflowed during the summer freshet; and as most of the country is covered with very heavy timber and a dense undergrowth, the progress of this portion of the survey must necessarily be slow. Long bridges will be required to cross Harrison and Pitt Rivers, which can be constructed of timber as no ice or drift logs run down them and they have very little current, the waters being backed up, in the summer, by the Fraser.

In addition to the plans and sections on the large scale directed, I have had a smaller section made, which will show at a glance the relative heights from the sea to the Great Shuswap Lake, and also a plan, on the same scale of two miles to the inch, of the whole district from Eagle Pass to Burrard Inlet. On it I have marked, by a firm red line, the course run last autumn from Hope to the Great Shuswap Lake, by the valleys of the Fraser and Thompson Rivers; and by a red dotted line, the portion at either end yet remaining to be surveyed in order to connect Eagle Pass with the Pacific Ocean.

I have also laid down on the map my exploration by Salmon River and Nicola Lake, so that you may thus be better able to judge of the advantages a line by that route would possess, should I be successful this summer in discovering some pass through the Cascade Mountains by which to descend to Hope.

Although the section by the Fraser and Thompson Valleys shews a very easy grade, and a large portion of the country is favourable for a railway, particularly from Spencer's Bridge to the Shuswap Lake, excepting only the Great Bluff near Cherry Creek; there are serious difficulties to be encountered in the Fraser Canon and between Lytton and Spence's Bridge. The first twenty-one miles from Yale, until China Bluff is

passed, being one continuous succession of precipitous rocky points and side hills, broken only in a few places by gravel benches. From China Bar Bluff to Lytton, with the exception of Jackass Mountain and the bluff six miles below Lytton, the country is much more favorable, as a number of gravel benches can be followed. Above Lytton there are several rocky points to be passed before reaching the Nicaomin, and one about three miles beyond that stream. The rest of the line to Spence's Bridge would run along the face, and at the foot of steep gravelly hill sides. There is one point, and only one, on the whole line where wet and springy ground is met with, at the Mud Mountain so named, between pegs 901 and 919 from Lytton. The soil at this place is composed of a reddish yellow marl intermixed with fragments of rock and alkali, and appears to be constantly but slowly being pushed down to the river by the superincumbent mass. The slope is not steep, the angle being about 25 degrees, but it extends a very considerable distance up into a gorge of the mountain. It evidently rests on sloping rock, which, indeed presents itself at the bank of the river, where it has a precipitous face of about fifty feet in height. In the spring this ground is very rotten and treacherous, and it is with difficulty that the drains can be kept opened; later on in the summer it becomes hard and compact, forming an admirable road.

At Spence's Bridge, formerly Cook's Ferry, the open bunch grass country fairly commences and continues without interruption to the foot of the Little Shuswap Lake, beyond which point the country is thickly timbered with fir, pine and some cedar.

The formation of this section of the country is very peculiar, being composed, like all the valleys east of the Cascade Range, of a number of benches rising in succession one above the other, of greater or less height, and broken at intervals by rocky points. Many of these flats or benches are composed of very rich soil, and raise large crops of grain and vegetables, where water can be obtained for irrigation; others again are somewhat stony and gravelly, but they are all covered, as well as the high bald hills behind them, with a luxuriant growth of bunch grass, on which cattle and horses become fat very speedily, and keep in condition throughout the winter.

On the Bonaparte and Thompson Rivers, and in the neighborhood of Kamloops, there are many fine farms, upon which a large amount of grain is raised, but not nearly to the extent that is possible, the market at present being very limited. Most of the settlers devote their attention to the raising of cattle, which are easily driven to the mining districts, and find there a ready sale.

Six miles from Yale on the waggon-road, limestone is found, from which lime of excellent quality has been obtained for building purposes. The lime for the masonry of the Alexandra Suspension Bridge was burnt here. Limestone also appears on both banks of the Thompson, about eight miles above Spence's Bridge, and at Nickola Lake and other points.

At Nickola Lake there has also been discovered a seam of coal of superior quality, and six feet in thickness. Small quantities have, from time to time, been packed down on horses to Cook's Ferry and Lytton during the last two or three years, and it is highly esteemed for black-smithing purposes.

For a more detailed description of the country and the line run, I would refer you to the plans and sections, and to reports and diaries of the two engineers in charge, Mr. Hurd and Mr. Homfray, which I forward with this. I also send a short report from Mr. McClure, explanatory of his section from Yale to Lytton. In future I have directed that the level be run on the surveyed line, unless where prevented by some insuperable obstacle. The dotted line on the plans will show where deviations, from the traverse line run, are suggested.

I also enclose with the plans the originals of all the field notes, copies of which I have had made, and shall retain for reference here. I have also kept copies of the plans and sections.

Annexed is a statement of the total expenditure on account of the two parties up to the 31st December last, amounting in all to \$24,211.76; deducting from the sum the value of stores on hand, pack-train, &c., it will be seen that the actual cost of the work done under my charge is \$16,716.10. I am glad to be able to state that I heard from Kamloops last week that all the animals of my pack-train which I left there in charge of Captain Layton, had survived the winter, and were improving in condition.

Immediately after despatching the plans and reports, I shall send out the two parties to resume the surveys at the points where they discontinued work last winter.

I have the honor to be, Sir,

Your obedient servant,

JOHN TRUTCH,

District Engineer.

APPENDIX No. 3.

(*Progress Report from Walter Moberly, Esq., in charge of the District between Great Shuswap Lake and Kootanie Plain.*)

VICTORIA, February 24th, 1872.

SANDFORD FLEMING, Esq.,

Engineer-in-Chief, Canadian Pacific Railway, Ottawa,

SIR,—I have the honor to forward you a report of the progress made in carrying out the Exploratory Survey, of the "Howse Pass District" of the Canadian Pacific Railway, of which I have charge.

I am glad to be able to inform you that my explorations last season, in connection with those made in former years by me,* of that portion of British Columbia, situated between the 49 and 52 parallels of North Latitude and extending from the gulf of Georgia to the easterly boundary of the Province, and thence easterly along the valley of the North Saskatchewan river to the north easterly end of the "Kootanie Plain" have resulted in the discovery of a tolerably direct and practicable line for a railway from the "Pacific Ocean" to the "Kootanie Plain"; and, considering the nature of the country west of the water shed of the Rocky Mountains, a much more favorable line than was, previous to those explorations, expected. (See Capt. Palliser's General Report. Dated April 4th, 1862. Page 16. "Objection to a line of railway across North America to the Pacific.") As a detailed report of the District extending from the westerly boundary of my District to the Pacific coast will be furnished you by Mr. John Trutch, the Engineer in charge, I shall in this report confine myself to the limits of my own District, which includes the most formidable mountains in the Dominion, viz. : The Rocky, the Selkirk and Gold ranges.

I arrived at Victoria from San Francisco on the 13th July last. Mr. R. McLennan who has charge of the explorations *via* the 'Yellowhead Pass' Mr. George Watt, Paymaster and Commissariat Officer of the Canadian Pacific Railway, and the rest of the staff appointed in Ottawa also came by the same boat. We used our utmost exertions to get the different parties, together with their supplies and instruments, *en route* for the interior, but experienced some delay as many articles had to be made before leaving Victoria, and the majority of the men needed to fill the parties, engaged. We were also unable at first to get pack animals or other modes of conveyance for the transportation of our supplies, &c., to the remote portions of the country to which we had to repair. We, however, managed to land the advance party on the mainland of British Columbia, on the 20th of July—the day upon which it became a portion of the Dominion of Canada—and on the 25th of the same month the rest of our parties destined for the Yellowhead and Howse Passes sailed for the Fraser river.

*Explorations have also been made, by others, of the country below Kamloops.

Mr. Arthur Selwyn, Director of the Provincial Geological Survey, and his party also left by the same boat. I landed at Hope with party **S**, which I decided to send that way to Wild Horse Creek in the Rocky Mountains and thence to the "Kootanie Plain" or the westerly end of the "Howse Pass" as circumstances might shew to be most advisable. Mr. McLennan, Mr. Watt and Mr. Selwyn with their parties and also my party **T** went on to Yale and thence to Kamloops, where I arranged to join them as soon as I had seen my party **S** fairly off.

Fortunately on my arrival at Hope I found that the mule train I had arranged to purchase before I left Victoria from the Hudson's Bay Company, would be in town the following day. The morning after my arrival I formed the camp and on the arrival of the animals I took possession of them, but was again disappointed in getting off, as the packers in charge of the train would not enter our service owing to the distance we were going away from their homes; I was therefore obliged to telegraph to New Westminster for others, and as soon as they reached Hope I put the train and cargo into order, and on the 31st July got it and the whole of party **S** off, having arranged with the Engineer in charge of the party that I would overtake the party before it reached Wild Horse Creek.

The purchase of the above pack animals turned out to be a most fortunate investment, not only on account of the low rate at which I got them and the increase in the value of animals within a week after their purchase, owing to the demand for animals to convey freight into the Peace river mines but more especially as there were not any other trains on this route, and without them I should have been compelled to take the party *via* Yale, Kamloops and Osoyoos Lake, and thence by the same trail *via* Fort Shepherd, which they followed to Wild Horse Creek, which would have involved a heavy extra expenditure, an increased distance of over 200 miles travel and above all such a loss of time that it would have prevented the party reaching the source of the Columbia river before winter set in.

The same day party **S** left Hope, I went by canoe to Yale and on reaching that town found Mr. Watt had been obliged to go on to Quesnel mouth, to see that party **B** were provided with supplies and means of conveyance to get from that point to "Tête Jaune Cache," owing to the above he had not been able to arrange for various supplies, &c., which were to have been purchased at Yale and forwarded to Kamloops; I therefore remained over a day at Yale and purchased and arranged for the forwarding to Kamloops, of a quantity of supplies for both Mr. McLennan's and my own party **T**. The following morning I went on as fast as possible on my way to Kamloops, but as a letter from Mr. McLennan reached me on the road stating that he could not get the necessary pack animals for his service at Kamloops and requesting me to arrange for some beef cattle, I saw one of the cattle owners on the Thompson river and purchased 22 head to be delivered at Kamloops in four days from the date of purchase. I afterwards found that I might have purchased cattle somewhat cheaper on the

Thompson river but placed as I was, and not wishing our parties to be delayed I could not run the risk of not having beef cattle on hand. I then proceeded to the mouth of the Bonaparte river to try and purchase a mule train I heard of in that vicinity. I could not see the animals that day as they were in the mountains, but arranged to meet the man in charge of them some 15 miles further on the following day. When having seen the animals I purchased them under agreement to be delivered to me together with *aparahoes* and rigging at Savona's Ferry the next day. I reached Savona's Ferry the same evening, where I found my *T* party, a portion of Mr. McLennan's and Mr. Selwyn's party. I had the *bateau* then at Savona's Ferry loaded with supplies for *T* party and gave orders for the whole of that party to go on to Kamloops the following day. I then hired a canoe and in company with Mr. Selwyn started for Kamloops which we reached the following morning, where we found Mr. McLennan very busy preparing for his trip up the north Thompson river. The next day, August 7, I started the whole of party *T* with supplies, &c., by water for the westerly end of the Eagle Pass with instructions to push the survey through that Pass to the "Big Eddy" on the Columbia river, and thence along the right bank of that river in the direction of the "Boat Encampment," with the utmost vigor. The result of their work you will find in detail on the plans and profiles and in the field books, diaries and reports of party *T* furnished me by Mr. Mohun, Engineer in charge, which I now forward to you. I sent Mr. A. S. Hall, Assistant Commissariat Officer, over by Seymour and Gold Creek with instructions to examine the country from French Creek to the mouth of the Blaeberry river, in order to ascertain if I could get animals over from La Porte, the head of steamboat navigation above Colville, to the Howse Pass as it would greatly facilitate and cheapen the conveyance of my supplies into that Pass. Mr. Hall was then to proceed to Wild Horse Creek and meet party *W* and myself. I remained at Kamloops until the 15th day of August assisting Mr. McLennan to get his trains and parties off, and then started with a few horses for Wild Horse Creek *via* Colville. I was surprised to see the quantity of fine agricultural and pasture land along the Shuswap and Salmon rivers and in the vicinity of Great Okavagan Lake, many settlers have occupied land in this section of the country since I was there in 1866, and good wheat and other cereals of a very superior quality, and vegetables that cannot be surpassed are now grown there; they also raise cattle and hogs, and with a market, of which they stand much in need, this portion of the Province would sustain a large and prosperous agricultural population.

At Osejons Lake I was detained two days making a contract with a packer to carry goods I intended to purchase at Colville, from that place to Wild Horse Creek, and also to get two horses for my own use. I reached Colville on the 27th August and arranged with Capt. A. T. Pugston, owner of the steamer "49," to make a trip up to the "Eddy" with a load of supplies for party *W*; next day I went on about 16 miles to the American garrison and town of Colville where I purchased about 40,000 lbs. of supplies, one half for the *W* and the other half for the *T* party. On the 30th August I left Colville and proceeded by the long and tedious trail

via Spokane, Pend'Oreille Lake, and a portion of the Fort Shepherd trail to Wild Horse Creek, which I reached on the 13th September, having overtaken the S party and train on the 11th. I found my party had to open the trail for a distance of from 200 to 250 miles, as the old trail, which had not been in use for three years, was blocked up with fallen timber and the fires that had swept over the country had burned up all the bridges and corduroys. Mr. Hall reached Wild Horse Creek the day before I got in. I here found the supplies you telegraphed to have forwarded to "Fisherville" before I left Ottawa, ready for me, and a most fortunate thing it was that they were sent on in advance, as it enabled me to set my train at work with hardly any delay in conveying them to the "Boat Landing," which is situated on the right bank of the McGillivray branch of the Columbia about 48 miles from its source.

I remained at Wild Horse Creek until the 20th, and during my stay there purchased some beef cattle, a small boat and canoe (the only ones I could get) and various other supplies that would be needed to winter my party on the Columbia river. The boat and canoe I sent up the Kootanie river loaded with vegetables, and had them hauled over the Kootanie river and the Columbia Lake, I subsequently had the boat and canoe employed with the other craft I picked up on the Columbia river in freighting my supplies from the "Boat Landing" to the mouth of "Howse Pass. Party S, with the first train load of supplies, reached the "Boat Landing" on the 27th September, and I at once sent the train back for other supplies to Wild Horse Creek; at this work the train was kept busy until winter set in. On my arrival at the "Landing" I was in a difficulty to get canoes and boats, but fortunately managed to get two old canoes from the Indians, and we picked up two boats that had been abandoned 7 or 8 years ago. These boats I saw in 1866 when exploring the Columbia River, for the Government of British Columbia. The boats and canoes although small, and in a very unsound state, were of the greatest service to us, as without them we should have been detained until we built some, as there is not any trail from the "Boat Landing," down the Columbia River. Time now was most valuable to me, as everything indicated the rapid approach of winter, and I was most anxious to get over to the easterly end of my District on the North Saskatchewan River, before the snow fell. I got my party and a portion of the supplies, down to the mouth of Blaeberry river on the evening of the 2nd of October, but to my great disappointment found there was not any feed for animals to be had. I had sent about 25 head of horses down through the swamps and brush, that form a border to the Columbia river, from the "Boat Landing," to the mouth of the Blaeberry river; these horses were to pack our supplies from the Columbia river, to the different depots I had decided to build in the Howse Pass, and a few of them I intended to take with me across the Rocky Mountains to the North Saskatchewan River. The following morning I moved about five miles up the Columbia River, where I found good feed, and met our horses on their way down. Here I formed our main depôt, on the right bank of the Columbia, which is known in all our notes &c., as the "Columbia

River Depot." The next morning I set the whole party at work, to see if we could get a trail opened to the mouth of the "Kicking Horse River," in order to render it unnecessary for our boats and canoes to run the rapid water between the mouth of that river and our depot; we opened the trail that day, for a distance of $2\frac{1}{2}$ miles, but found we would have to give up the idea of a trail for the present, owing to the nature of the ground, as more labor would be required to make it passable than we could spare. The trail however, opened a large tract of land covered with good feed for animals, which was very valuable, as it always enabled us to drive the horses on it, when they came down to the depot. At the same time the party were at work on the above trail, I examined and blazed a line for a trail from the depot to the Blaeberry river, (shown on our map of the Howse Pass) over a low spur of the mountains lying to the south of the "Howse Pass." I now set the party at work opening this trail, building the various "Depots," forwarding and storing the supplies in them, and running a Traverse and levels, along the Blaeberry river to the height of land between the head waters of the above river and those of the North Saskatchewan river, and taking three Indians and eight horses I pushed on ahead to mark the line for the trail and make my way over to the "Kootanie Plain." As the fresh snow was all the time accumulating on the mountain tops, and gradually getting lower and lower down their sides, it was a most anxious time for me, as I decided not to return until I had a look at the whole of my district. I did not take any of my party, with the exception of the above Indians, as I did not want to endanger them, should the snow fall before I got back; and in all my mountain explorations I have found that I can move much more rapidly when not encumbered with white men. The Indian, also, when properly handled and made to feel that confidence and trust is reposed in him, will work in all kinds of weather, and should supplies run short, on little or no food, without a murmur; not so the generality of white men, particularly when working for a Government, although in justice I am bound to say that the white men, in both my S and T parties, could not have worked better or more faithfully than they did, in all kinds of weather.

By chopping and hacking our way through the underbrush, and jumping our horses over fallen timber, and incessantly wading up and across the Blaeberry river, we reached the "Summit Camp," which is about one mile from the true height of land, on the evening of the 17th of October. Here our troubles ceased, as we found excellent feed for our nearly famished horses, and got clear of all the underbrush and fallen timber. The Indians now wished to return, as they thought the snow might begin to fall at any moment, and cause us to lose our horses (three of the horses belonging to them) but as I calculated that I could reach the "Kootanie Plain" in about three days, I told them that I would only travel three or four days more, and that if their horses were lost or left behind I would replace them when I got back to the Columbia River, so they went on willingly. I concluded that if the snow fell before I got back, to push on to the Rocky Mountain House and winter my horses there, and then make the journey back to the Columbia River on snow-shoes.

I took several observations with Aneroid, Boiling Point and Thermometer, at the "Summit Camp," and found my Aneroid had suffered a considerable derangement the day I reached the above camp; This I attribute to a fall I had with my horse of about twenty feet; as I was riding along a steep bank the soil gave way and we both rolled down into the "Blaeberry River," and as I fell against a tree the sudden jerk evidently knocked the delicate hand of the Barometer out of place. The proper note of this is made in my Table of Observations, so that the readings from the "Summit Camp" can be calculated separately from those made previous to the above accident.

I now travelled on through the "Blaeberry Nick" for about half a mile, when we came to a number of springs which form the source of the "Blaeberry river"; another half a mile brought me on to one of the streams that form the head waters of the "North Saskatchewan river." There is but little difference in the level of the ground between the summit camp and the waters of the North Saskatchewan where I first struck them. On reaching the last mentioned stream we followed down the shingle flats through which it flows, and after passing a short *canon* where the cliffs on each side do not rise to any great height we emerged on the extensive shingle flats that sweep around the base of Mount Forbes, on its southerly and westerly sides. A larger fork of the North Saskatchewan river forms a junction with the one we followed from the "Height of Land" in the the "Blaeberry Nick" at a distance of about five miles from the "summit camp," the valley then takes a bend to the right and after passing through a narrow opening with rocky banks we again came on a very extensive shingle flat which continues down to the stream that flows from "Glacier Lake." As the reports on the Eagle and Howse Passes, together with the accompanying Field Books, Journals, Plans and Profiles, &c., &c., will give full details, I shall not enter into them in this report. We camped among some low sand hills nearly opposite to the opening through which the stream flows from "Glacier Lake." We saw many tracks of the Elk, the Cariboo, the Mountain Sheep, and Goat, the Grizzly and Black Bear and the Panther. The night being clear and calm I walked out on the shingle flats for a mile or two to enjoy the grand and magnificent scenery with which I was surrounded, but the unpleasant cry of a panther close to me was a hint that I had better get back to camp. The next morning we followed the right bank of the river and at once struck upon a good and well beaten horse trail, seeing the remains of innumerable camps some of which had evidently been occupied two or three days before our arrival. We forded the "Little North Fork" of the Saskatchewan at a distance of about three miles from our last camp and when we had followed the trail for about 10 or 11 miles we forded the main river to the left bank as the ground on the right bank becomes broken and rugged and the trail is bad and but little used—probably only travelled during high water when animals cannot ford. Immediately on reaching the left bank of the river we came on a capital, well beaten and nearly level horse trail which we followed all the way to the "Kootanie Plain." I camped at a point I thought was about 2 or 3 miles above the "Kootanie Plain" and the following day, October

19th, I travelled to the north easterly end of the Plain, then forded to the opposite bank and hunted in all directions in order to ascertain if any signs of the party in charge of my brother Frank could be found. As I was satisfied they could not as yet have been to this point from the east (we arranged to meet here before I left Ottawa) and as the winter was too close at hand for me to wait or go on to the "Rocky Mountain House" I recrossed the river to the left bank and when I got on the main trail picked out a conspicuous grove of firs on the trail in the middle of a prairie which we blazed and marked and then having deposited a letter for him I commenced my return journey and reached my last night's camp where I staid. The two following days were occupied in returning to the "Summit camp" which I reached on Sunday the 22nd October at 2 p. m. The thermometer stood at 50° in the shade; the extraordinary warmth of the weather during my trip through the valley of the Saskatchewan has quite astonished me and I at this time concluded we must have had a very late and fine season. I took a bath in the head waters of the Blaeberry river and found the water quite pleasant. After my return to the Columbia and Thompson rivers I found from the miners and settlers that the winter had set in much earlier and with a greater degree of severity than any other of which they had any record.

I was very much disappointed to find that my party had not as yet reached the "Summit Camp" so the following day I started down to meet them; at a distance of two miles I met Messrs. Gillette and Rheame, who were running the levels, and they informed me the party were camped about four miles farther down on "Three Creek Flat," so I went on there and camped. In the morning I had the party out cutting a trail from Three Creek Flat up in the direction of Summit camp, and at the same time I moved the camp up 2½ miles, and instructed the party to continue next day at work opening the trail to the summit for our pack animals as Mr. Gillette informed me he would have the trial levels to the height of land completed by that time, and Mr. Green said the same with regard to the Traverse, both of which were fortunately accomplished. The snow to-day, October 25th, fell on the river bottom, and everything looked very wintry and miserable; however, I thought I might yet manage to get the regular line of survey down from the summit, so I sent word for the whole party to meet me at the summit with their instruments &c., &c., ready to commence work in the morning. I found it had snowed a good deal during the night, but I started up at daylight and overtook my party just as they reached the Summit camp. There was now eight inches of snow on the ground and it was snowing heavily, but there was not any frost in the ground. We tried to commence the line but our instruments got full of water and it was impossible to walk along the steep side hills with the new wet snow. I therefore gave orders for the party to return to camp, which we reached some time after dark. Seeing now that it would be useless to endeavor to survey the line from the "summit" as both my party and horses would be endangered and the horses certainly lost as they had no feed, I decided to move down to our Dépôt No. 2 and try and survey the line from this point down to the Columbia river. I there-

fore got all the party and horses down to that station on the 30th October, but when we got up the next morning we found the snow was following us, and between daylight and 9 a. m., nine inches of snow fell. I now felt convinced the winter had fairly set in, so I reluctantly gave orders for the whole party to make for the "Columbia River Dépôt" as fast as possible. I got in with some of the horses on the 3rd Novovember, and the rest of the party and horses all got down by the 6th. I now set all hands at work building houses to winter in, and my staff getting the plans and profiles ready to take down with me. I also sent for Mr. Hall to come to the "Dépôt" at as early a date as he could, and get the remainder of our supplies down from "The Boat Landing" before the river got frozen up. In this I was not successful as the first severe frost came on the 13th November, and stopped all further boating on the river. I now sent up the horses to join the mule train which I gave orders should go into winter quarters near the "Boat Landing;" and at the same time sent instructions for Mr. Hall to come down with all the accounts, so that I could take them with me to Victoria. Mr. Hall arrived on the 27th day of November, and having got everything in shape on the evening of the 3rd December, I gave my final instructions to the party (a copy of which I have already forwarded to you) and on the 4th December commenced my journey down to Victoria with the intention of visiting party T on my way, and also exploring the Pass reported to exist through Selkirk Range between the head waters of the Bushay and Gold rivers. After a long and most difficult journey on snowshoes in the worst period of the year for traveling, as the snow was newly fallen, and the ice not safe, reached the "Eddy" on the 22nd day of December, where I found party T, safe in their winter quarters. I found there was not any practicable pass through the Selkirk range, as the summit was upwards of 6,000 feet above the sea level—4,000 feet of which altitude is gained in about five miles—and for several miles along the lowest portion of the Summit Valley which lies between two ranges of mountains that rise from four to six thousand feet higher than the above valley, and from these mountains, even at the early part of the winter, when I crossed them, enormous avalanches had slid down with such force that in several instances the snow and ice of, which they were composed was formed up the opposite side of the valley to a height of from 1,000 to 2,000 feet.

I was detained at the "Eddy" six days waiting for the plans, profiles, accounts, &c., &c., of party T, but on the 29th day of December I again started on my downward journey through the Eagle Pass and *via* the great Shuswap lake and the river of the same name for Kamloops which I reached on the 9th day of January. The journey through the Eagle Pass was very difficult, as there was not snow enough to cover the dense underbrush and fallen timber which made it almost impossible in many places to use our snowshoes, and the snow was so soft that walking without them was extremely tedious and tiresome. The greatest depth of snow in this pass did not exceed two feet when I passed over it. On my way to Kamloops I explored a pass from the north westerly end of the Salmon river arm of the great Shuswap lake to a point opposite the Island near the west

end of the main arm of the same lake, this pass may be made available for the line of railway should the route *via* Salmon river, explored by Mr. John Trutch last autumn, not be adopted.

The Eagle Pass derived its name from the following circumstances :—

In the summer of 1865, I was exploring the Gold Range of mountains for the Government of British Columbia, to see if there was any Pass through them. I arrived at the Eagle River, and on the top of a tree near its mouth, I saw a large nest full of eaglets, and the two old birds on a limb of the same tree. I had nothing but a small revolver in the shape of firearms; this I discharged 8 or 10 times at the nest, but could not knock it down. The two old birds after circling around the nest, flew up the valley of the river; it struck me then, that if I followed them, I might find the much wished for Pass. I explored the valley 2 or 3 weeks afterwards, and having been successful in finding a good Pass, I thought the most appropriate name I could give it, was the "Eagle Pass."

I remained at Kamloops two days, settling accounts with the Shuswap Indians I brought over with me, and getting horses ready for my journey to Yale, and on the 21st day of January I reached New Westminster; by the first Steamer I went over to Victoria, where I have since been preparing my accounts, plans, reports &c., and making preparations to have everything in shape for an early start in the Spring.

The "Howse Pass District" extending from the westerly end of the "Eagle Pass," to the "Eddy" on the Columbia River, thence by the valley of that river, to the mouth of Blaeberry river, thence up Blaeberry river to the "Height of Land" in the Rocky Mountains, is covered with a dense growth of various kinds of timber, generally of a large size, and in most places, with a very thick undergrowth of different descriptions of shrubs and bushes—fallen timber also abounds, and from the above causes and the difficulty of getting our supplies along without roads or trails, the progress of the survey along this portion of the line, will necessarily be slow. From the Height of Land to within four miles of the Kootanie Plain, along the line the Railway will most probably run, is also generally covered with a thick growth of Fir and Spruce, but not of large size. From the Height of Land eastward, along the valley of the North Saskatchewan, plenty of good feed for animals exists. From the same point westward along the valley of the Blaeberry River, with the exception of a few rushes, there is not any feed; but at our "Columbia River Depot" and thence up to the "Boat Landing," there is plenty of feed consisting principally of swamp grasses. At the latter point the bunch grass country is reached, which extends without a break as far south in the United States Territory as I have been, viz., in Utah and Nevada and most probably much farther.

The general results of my season's work have been:

1st. To run a traverse and levels through the Gold Range of moun-

tains *via* the Eagle Pass, from Great Shuswap Lake to the Eddy, a distance of forty-four miles, which has satisfactorily shewn that a very favorable line for a Railway can be obtained through this pass. The highest point to be passed over, is 747 feet above Great Shuswap Lake, and a regular and easy grade can be got to it, as the summit is 38 miles from that Lake.

2nd. To run a trial line with traverse and levels along the Blaeberry river, which flows through Howse Pass, from the Columbia River to the head waters of the North Saskatchewan river, which shows conclusively that a line for a railway can be got through the Rocky Mountains. The height of land above the Columbia river at our depot, is 2470 feet.

3rd. To explore the country from the height of land in the Rocky Mountains, to the Kootanie Plain, by which I have ascertained that an easy line for a railway can be obtained all the way, with a light descending grade. The distance I estimate at about forty miles, and the difference of level, by means of observations made with Aneroid and Boiling point Thermometer, at 355 feet.

4th. To build depots at various places in Howse Pass, and at the Eddy Columbia River, and store them with supplies, to enable my parties to continue the explorations during the winter, and to resume the instrumental survey early in the Spring.

5th. To open about 300 miles of trail for pack animals, some of which was on the old government trail between Fort Hope and Kootanie, and the rest through the Howse Pass. All this work I was obliged to have done in order to get my party to the Rocky Mountains.

6th. To explore through the Selkirk range of mountains, from one of the forks of Bushay river, to the waters of Gold river, where a pass was reported to exist, but which I consider quite impracticable for a railway, although a pass might yet be found from another branch of the Bushay river, to the head waters of Gold river, but I think the existence of a good pass there is very doubtful.

7th. To explore and find a pass connecting the westerly end of the Salmon river arm of the Great Shuswap Lake, with the westerly end of the main arm of the same Lake, and which might be adopted as I before observed, for the line of railway, should the valley of the Salmon river not be chosen.

It may, perhaps, be premature for me to point out some of the commercial advantages this line will have, but it is my belief that some of the principal ones (not taking a through traffic from China, Japan, &c., &c. into consideration) are :

1st. That the land suitable for agricultural settlement extends further westward along the valley of the north Saskatchewan river than by any other route yet known, and there is an enormous tract of rich pasture land adjoining it. Coal, in large quantities, is also reported to exist as far up the river as the Rocky Mountain House.

2nd. That within a short distance from the point where agricultural land, east of the Rocky Mountains, ceases, the road would open a considerable tract of land suitable for settlement along the valley of the Columbia, south of our depôt and extending down the Kootanie river; it would also open up a country on this portion of the line, where much valuable timber could be obtained that will be needed by settlers in the Saskatchewan valley.

3rd. It would enable capitalists to develop the rich mineral resources of the Selkirk and Gold ranges of mountains, as both Placer mines, and gold bearing quartz of a very rich quality, are known to exist; the placer mines are now, to a small extent, worked at Wild Horse, Perry and French creeks; and silver bearing rock of a superior description has been discovered in the Selkirk and Gold ranges. Ore from the Cherry Creek Silver mine, situated on the westerly slope of the Gold range, in the vicinity of Great Shuswap Lake, sold in San Francisco, when reduced to pulp, for \$445—gold—per ton of 2,000 lbs.

4th. Proceeding still farther westward as soon as the mineral ranges, above referred to, are passed, the line would emerge into the agricultural and pasture region adjoining the Thompson, the Shuswap, the Spillmee-chee and Salmon Rivers, and in the neighborhood of the Great Okanagan and Nicola lakes. Near the latter lake, I understand, coal of a good quality was discovered last summer; again, in passing through the Cascade range, it would run by the mineral region of the neighborhood of Fort Hope, where large bodies of silver ore exist. The valley of the Fraser, from the vicinity of Fort Hope to the Pacific coast, contains an extensive tract of rich agricultural land which is generally covered with a heavy growth of large and valuable timber.

You will thus observe that throughout nearly the whole length of this line, either agricultural or mineral resources will always serve to create a large and profitable way traffic.

I do not think that a shorter practicable line can be found, particularly if a good line could be obtained in a more direct course from the Rocky Mountain House to Fort Ellice and thence to Fort Garry than by following the valley of the north Saskatchewan by Forts Edmonton and Pitt.

The late date at which I was able to get away from Victoria, the great distance I had to take my parties and supplies into the interior, over a rough and comparatively unopened country, and the early date at which the winter set in, have all tended to prevent as much progress being made in the Exploratory Surveys in my District, as I should have wished; but the general result is, that now there is a certainty of having a line for a railway, from the Pacific Coast to the Valley of the North Saskatchewan; and it is my impression that the same difficulty, will not be experienced on this line with regard to snow blockades as has just occurred on the Union Pacific Railroad.

I applied to the Government of British Columbia for reservations of the ground around the "Columbia River" and "Eddy" depots, and they have in each case made a reservation of 640 acres for the use of the Railway.

The tables of meteorological observations, that I took during my trip, I forward to you, as they may be interesting to those taking an interest in the portions of country traversed by me; and I would suggest that the Government of the Dominion, furnish me with proper instruments to obtain a complete set of observations at three or four of my principal depots, as I have a very good opportunity of having them taken, during the progress of the surveys. These instruments should be forwarded without delay to Victoria, so that I could take them up with me.

I may here mention, that the description given by Dr. Hector, of the portions of the country traversed by me, and that were formerly explored by him, when connected with Captain Palliser's Expedition, I found to be very clear and accurate, and as I had his journal and reports always with me, I found them invaluable.

The accompanying accounts will shew you the gross expenditure in my district, up to January 1st 1872, and the value of the supplies now in the different depots for the use of the parties during the current year, and such other details as will enable you to fully understand the financial position of the district.

I remain,

Sir,

Your Obedient Servant,

WALTER MOBERLY.

APPENDIX No. 4.

(Progress Report of Exploration from Yellow Head Pass westerly by the Cariboo District and by the North Thompson River, by R. McLennan, Esq., in charge.)

CANADIAN PACIFIC RAILWAY.

Ottawa, 23rd. March 1872.

SANDFORD FLEMING ESQ.,
Engineer in Chief. }

I respectfully submit the following report of my proceedings, and of the progress made on that portion of the Survey in British Columbia, placed under my charge in June last. In accordance with instructions, I proceeded to Toronto on the 20th of June, and remained there a couple of days, arranging for the purchase of instruments and other requisites. On the 22nd, accompanied by Mr. Walter Moberly C. E., Mr. George Watt, Commissariat Officer and others, left Toronto by rail, for San Francisco, and arrived there on the 29th. At this place we had to await the sailing of the Steamer for Victoria. This time was utilized in procuring instruments &c., which were not to be got in Toronto. On July 3rd we left by the Steamer *Prince Alfred* for Victoria and arrived there on the 9th; the journey from Toronto to Victoria occupied eighteen days. Immediately after arrival at Victoria, commenced to organize parties, engage axemen and pack men, purchase supplies, and get all possible information about the character of the country to be explored, and the best means of reaching it. On the 20th July, this work was so well advanced, that party **B** under the charge of Mr. James A. Mahood, was able to leave for its destination. The duty assigned to this party was the exploration of the country to the east of Tête Jaune Cache, on the most direct route to Quesnel Mouth. It was first intended, that party **B** should proceed by the following route, viz:—by Steamer to Yale, a distance of one hundred and eighty-five miles, thence by Stage to Quesnel Mouth, three hundred miles, thence up the Fraser River to Tête Jaune Cache; the difficulty of getting boats at Quesnel Mouth, and the time that would elapse before they could be got, together with fuller information subsequently received, regarding the country lying easterly from Cariboo, to Tête Jaune Cache, induced a change in the latter part of this route. This change was adopted, because the people of Cariboo averred, that by passing eastward from that place to Tête Jaune Cache, the journey could be made in twenty or twenty-five days, and the exploration could be completed much more rapidly and economically.

After party **B** left I began the organization of party **C** to explore for a line from Tête Jaune Cache towards Clear Water, or Quesnel Lakes. It was decided that this party should proceed by the North Thompson River, in order to ascertain the facilities the country adjacent to, and

especially west of the river, offered for approaching Tete Jaune Cache by railway. Having partially organized this party, I left Victoria on the 25th, accompanied by Mr. Moberly and the parties under his charge, and Mr. Watt, and arrived at Yale on the 27th, where I overtook party R.

Finding neither horses nor waggons could here be hired or purchased, for the transport of party Q, Mr. F. W. Green was sent ahead by stage to arrange for meals and lodgings, and the party started on the 28th to march to Fort Kamloops, a distance of one hundred and fifty-four miles. Expecting to be joined by Mr. Moberly, who had stopped at Hope to start a party towards Howe's Pass; I remained at Yale till the 31st, and he not having arrived at this date, Mr. Watts and I proceeded by Stage to Fort Kamloops. At Lytton, fifty-five miles from Yale, I overtook the party, many of whom were now foot sore and lame, after engaging waggons to carry those who were unable to walk, proceeded on my journey reaching Spences Bridge at midnight. Next morning left for Cache Creek, one hundred and ten miles from Yale, and arrived there in the forenoon; at this place I left the stage, and continued the journey on horseback, the next morning I left for Savonas ferry, and arrived there in the afternoon. Here I overtook Mr. Green, and about midnight, eight or nine of the party arrived hungry and tired. Mr. Green was left at this place to forward men and supplies, as they arrived. On the morning of the 3rd August, with seventeen men, took boat up Kamloops Lake, a distance of twenty-two miles to the Fort of that name, and arrived there in the afternoon. The next day the men were allowed to rest, many of them being lame.

August 5th was spent in assorting stores for shipment, in building a boat, and waiting for some horses purchased by Messrs. Moberly and Watt from the Hudson Bay Company, which came in on the 6th. Some of these horses were not able to pack and had to be rejected, and the search, in a sparsely settled country, for others to replace them, entailed a loss of time. Some of the outfit for packing was much worn and needed repairs; the material for these repairs had to be got from Clinton, a distance of seventy miles, and blacksmiths to shoe the horses had to be brought fifty miles. The scarcity of experienced men to drive the pack horses was another difficulty, which, together with those before mentioned involved the outlay of a large sum of money and vexatious delays.

August 5th, Mr. F. W. Green arrived with the last boat load of the first shipment of supplies, and next morning started with a party of twenty-seven, including staff, cook, axemen, and two Indians; he was also accompanied by James Jamieson and three assistants in charge of a pack train of forty horses. For the purposes of supplying the men with fresh beef occasionally, and saving the transport of bacon, thirty head of cattle were taken along with this party. After starting Mr. Green I completed arrangements for a mule train for C. T. Cooney, packer. From a Mexican just arrived from Montana, I purchased eight mules, with outfit or aparajoes complete, for one hundred and fifty dollars per head, making Cooney's train, in all, thirty-three mules. I also agreed with the Mexican to carry

freight with thirty-one mules, 100 miles for three cents per lb., or one hundred and fifty miles for five cents, binding myself to pay him twenty-five dollars per day for demurrage should he be kept waiting for a trail. Having thus completed the best possible arrangements for forwarding supplies by pack trains, I dispatched two boats, laden with stores, to Clear Water, distant seventy miles from Kamloops, to be ready for the trains on their return. I also gave Mr. Watt a requisition for further supplies to be forwarded as far up stream as possible before the season closed. Mr. John McLennan, brought by Mr. Moberly from Utah, because of his superior knowledge of the river, was left at Kamloops to push forward the supplies to the party on the North Thompson, and to party T, which went by Shuswap Lake to Eagle Pass.

On the 18th August I left Kamloops with the train of the Mexican, Michael Carencio, instructing C. T. Cooney to follow as soon as he could get ready. On the evening of the 19th I overtook Mr. Green and party about forty two miles from Kamloops, and as he expressed fears about the ability of some of the horses to finish the journey, I wrote Mr. John McLennan instructing him to purchase and forward to packer Jamieson ten horses as speedily as possible. In order to accelerate the movements of the party I took the best of Jamieson's horses to pack tents blankets and some stores, which was found to work well. Instead of finding as was anticipated a fair trail for one hundred and twenty miles from this point, the party had here to begin clearing it out. The next day Assiniboine Bluff was reached and a day spent in making about a quarter of mile of trail, part of which ascended 70 feet per 100 horizontal; the greater part of a day was consumed in getting the advance train over this place. From this point the opening of the trail on the east side of the river was continued until the 25th August, when a crossing was made to the right or west bank at the head of boat navigation, one mile above the mouth of Clear Water river. It was decided to establish a depot at this point, and a house built here by a Canadian trapper was utilized for a store house. Mr. John Glassey was left as depot clerk, and Thomas Ekman to boat the stores across, as fast as they were brought up by the pack trains. The cutting of the trail was continued and a place marked "Meadows" on Mr. Trutch's map was reached on the 31st August. The Mexican Carencio, having at this point accomplished one hundred and fifty miles refused longer to continue his contract for packing. Having no other available means of transport I was compelled to purchase his train, and pay him and his men wages; under the new arrangement he agreed to remain as long and go as far as any of the other trains. At this place a new difficulty arose, the Indian guide brought by Mr. Selwyn from Kamloops maintained that at this advanced season it would be impossible to cut the way through along the river, he professed a thorough knowledge of the country, and said that between this place and Blue river there were many *canons* which would render trail making very difficult and tedious, he also added that for forty miles of the distance, there was little or no grass, which would necessarily very much reduce the pack trains if it did not prove destructive to them all. It was after consultation decided to return about six miles and ascend the mountain

on the left by the valley of Mad river, this route it was said would pass through an open bunch grass country to the mouth of Blue river. On the following day (September 1st) the mountain was recrossed and on returning to Mad river Mr. John McLennan was met bringing up ten horses to replace some that were worn out which he took back. By this route the top of the mountain was reached in six miles from the Thompson river. This trail was in many places 6,000 feet above the sea level, or nearly 3000 feet above where it left the river, though a little shorter than by the river it afforded neither the facilities for travelling nor grazing that was anticipated. On the 13th of September, after travelling thirty four miles, the river was again reached about three miles below the mouth of Blue river, the rate of travel being less than three miles per day. From this place I sent C. T. Cooney back to Clear Water for additional supplies, dividing his load between packers Jamieson and Carencio, and instructing them to work up alternately so as to keep all the supplies as near the party as possible. Here additional difficulties were encountered, the underbrush was dense, and enormous fallen cedars strewed the ground and lay heaped together sometimes half a dozen on a spot. The ground naturally damp had by the incessant rains been converted into a quagmire, even gravelly hill sides became almost impassable when travelled over. It was most difficult to make a trail at all, and in places it was impossible to pass until the trail was either bridged or a corduroy road made of it. It now became a question whether under the adverse circumstances the journey could be continued to the main stream at the mouth of the Albreda river, distant about 20 miles. Some of the packers were discontented and strongly expressed their desire to return, the cold rains and muddy or boggy roads were telling fearfully on the animals, and it was evident that most of them would soon have to succumb; assuring the men with the hope that I firmly believed a better country would soon be reached, I decided to push on even at the sacrifice of all the pack horses and mules, rather than the expedition should be prolonged for another season. The hope, and the promise to be allowed to return when the difficulty was overcome, seemed to inspire the men with new courage, and the river was reached opposite the mouth of the Albreda. A detention of two days occurred here in making canoes to ferry the men and stores to the east side of the Thompson river. On the 5th of October the party crossed the Thompson and started along the right bank of the Albreda, the travelling some days being as bad as on the other side of the river, with but little prospect of improvement. On the 9th, Mr. Selwyn kindly volunteered to make a vigorous effort to reach Tête Jaune Cache, to ascertain if Mr. Mahood had arrived there from Cariboo, while I continued to cut the trail and push through with the trains.

On the 10th the head of Albreda Lake was reached, the country here was entirely different from that through which the party had been passing for some weeks, which had a re-animating effect upon all. Following a comparatively open valley running in a north-westerly direction, the party, on the thirteenth of October, reached Canoe River, about two and a half miles above its confluence with the main stream. Mr. Selwyn was here met on his return from Tête Jaune Cache, he having found no trace of

either Mr. Mahood or his party. As timber for building purposes or fuel was scarce at this point, it was thought advisable to return to a dense clump of fir trees about seven miles back, where water was also convenient and establish the winter camp. As the hills on either side of us were now covered with snow, arrangements were made for the return of the packers at the earliest moment. An examination of the stores on hand made it apparent that to provide against want until the return of the supply trains in June, 1872, it would be necessary to reduce the party to thirteen all told. After consulting with Mr. Green, and deciding upon the disposition to be made of the party, I determined, if it was possible, to make my own way to, or through the Leather Pass. Messrs. Selwyn, Hammond and Baltzby of the Geological Survey, proposed to accompany me. The party left Canoe River on the 16th of October and arrived at Moose Lake on the 19th. The most of the route to Tête Jaune Cache was fair, the only obstacles being fallen timber. From the crossing of the Fraser River at the Cache to Moose Lake, fallen trees, occasional bogs and gravelly benches interrupted our progress. As the horses were now showing symptoms of succumbing to over-work, the question of returning was discussed, and it was decided to continue the journey another day. Next morning the party travelled along the margin of the lake to its east end—a distance of about 14 miles—here the character of the valley and stream greatly changed, the stream being about forty feet wide, and sluggish; the valley was about a mile in width, very flat, and in most places too soft for horses to travel over; it was dotted with small meadows, and timbered with stunted spruce trees. Although very desirous of advancing farther, it was unanimously decided not to do so, as it was felt the stock of provisions was barely sufficient to take the party to its starting point. On the 21st the return began, and Canoe River was reached on the 24th; the estimated distance travelled by the party in nine days being about ninety miles. On the 26th October, accompanied by Mr. Selwyn and party, I left Mr. Green's camp for the Thompson River crossing which was reached on the 28th. Here it was decided to go down the river, and as some canoes had to be made, it was the 2nd November before the party left; in two days the head of the rapids was reached. For nine miles from this point the canoes had to be lowered by ropes, one of the portages was three quarters of a mile long, three hundred feet above the level of the water, and took nearly two days to cross it. Travelling six days at the rate of a mile and a half a day, Salmon River was passed, after which there was an unobstructed passage for twelve miles. At the confluence of Mad River with the Thompson one canoe was lost, we were compelled to abandon another, and to cache the photographic instruments; the provisions, clothing, papers and notes of the party were placed in the two remaining canoes, in charge of the Indians, while the other members walked by the trail to the depot at Clear Water, which was reached on the 14th of November. The party arrived at Kamloops the following day simultaneously with some packers and axemen who had left the camp at Canoe River some seven days earlier. These men came by the trail and suffered severely; on their journey they had been compelled to abandon many horses and mules that gave out on the

way. At Kamloops all the men were discharged except C. T. Cooney, packer, and one or two axemen, who were retained to tend the horses and mules as they came out during the winter. The rest of the party I brought with me to Cache Creek on the Cariboo Road, and distant from Yale one hundred and ten miles. At this place I learned from "Davis," one of the packers of Mr. Mahood's party who had just come down from it, that it would be impossible for me, so late in the season, to reach the party. Under these circumstances, and thinking I might hear from "Mahood" on my arrival at Victoria, I abandoned the idea of joining him, continued the journey to Victoria, and arrived there on the 4th December. After arrival, the remainder of the men were discharged except W. N. Patterson, transitman, and C. L. Howse, store-keeper, who were retained to do office work, and adjust some accounts connected with the survey.

Having given an outline of the purposes of the expedition, and some of the difficulties met with, I shall now submit a short description of the principal features of the Thompson River and its valley, between Kamloops and Yellow Head Pass.

KAMLOOPS TO ST. JOSEPH, 47 MILES.

Valley from two to four miles wide. The river between the above named places passes between two rocky points, each about one mile long; soil chiefly good for farming purposes, thinly wooded with fir trees, with little underbrush; bunch grass is abundant; stream navigable for boats of two or three tons or small steamers.

ST. JOSEPH TO CLEAR WATER, 23 MILES.

Valley about two miles wide, much of which is suitable for Agriculture; the Assiniboine Bluff (slate rock) is in this section; woods of fir; river navigable for boats or small steamers.

CLEAR WATER TO MAD RIVER, 26 MILES.

Valley about $\frac{1}{4}$ mile wide for about 2 miles; then widens out gradually for four miles to Raft River where it is about $1\frac{1}{2}$ miles wide, it again narrows to $\frac{1}{4}$ mile at Mad River, which is the limit of Bunch grass. This valley is formed of high gravelly benches, timbered with fir, poplar and cotton-wood; stream rapid, and not well adapted for boating or canoeing.

MAD RIVER TO SALMON RIVER, 25 MILES.

For about six miles the valley attains a width of half-a-mile, and at nine miles, is only a quarter mile wide, and continues about this width for about six miles, it then expands abruptly to two miles wide, and maintains this width for ten miles, or to Salmon river, near which are large meadows of wild hay, the valley is composed of benches from one hundred to two hundred feet high in the narrow portion, and flattened out

in the wide part. The stream in this section, is a succession of rapids and smooth water, the former predominating for about fifteen miles, thence to Salmon River is smooth water, and the river in places 300 yards wide.

SALMON RIVER TO BLUE RIVER, 25 MILES:

For about 9 miles the river is a continuous rapid, with three *canons* with falls of 6, 12 and 8 feet, after which the stream is swift water for about six miles (the north arm of the Murchison rapids) thence for ten miles a few slight rapids, and the rest smooth water; timber, chiefly large cedars and hemlocks; the valley about 300 yards wide is formed of benches, 100 to 200 feet high, the *canons* are hemmed in by slate rock about 100 feet high, and nearly perpendicular, averaging from 50 to 75 feet wide, and in the aggregate, about one mile long; the greater portion along these rapids being rock; from the head of the rapids to Blue river, or about 10 miles the valley widens out to from 3 to 4 miles, with alluvial banks four to five feet above high water.

BLUE RIVER TO NORTH FORK (RIVER CROSSING) 30 MILES.

In about five miles the valley closes into $\frac{1}{2}$ mile in width, and from here to the North Fork continues about the same; the banks are chiefly gravelly benches with a few slides of talcose slate; timber mostly enormous cedar, spruce and fir, with dense undergrowth, this section is well adapted for canoeing, and is interrupted only by one portage of about half a mile in length.

NORTH FORK TO ALBRED A LAKE, 12 MILES.

This valley is about half-a-mile in width and formed of gravelly benches about fifty feet high, interspersed with flats or wild meadows, heavily timbered with cedars and spruce.

ALBRED A LAKE TO FORKS OF CANOE RIVER, 10 MILES.

Valley from $\frac{1}{2}$ to $\frac{3}{4}$ of a mile wide, open country, chiefly burnt land, composed of benches of small boulders with a few rocky points of granite and sandstone.

CANOE RIVER TO TÊTE JAUNE CACHE, 13 MILES.

A fine open valley 5 miles wide, with sand benches on the sides, thinly timbered with small firs and willows, and directly in the range of an extensive valley, beginning at the Boat encampment, and extending in nearly a direct line for thirty miles down the Fraser River valley, or a total distance of from 75 to 80 miles; a fine farming country, pea vines, vetches and grass abounding.

TÊTE JAUNE CACHE TO MOOSE LAKE, 24 MILES.

This Valley is about $\frac{1}{2}$ mile wide for 10 miles to the Grand Forks of the Fraser, it then increases in width, and is full of limestone pebbles, the valley has high gravelly benches, with a few points of calcareous slate rock; from this point it narrows for about two miles, and slides of shale come in some places close to the water's edge, with a slope of $1\frac{1}{2}$ horizontal to 1 perpendicular, thence it expands to about a mile in width at the west end of Moose Lake, and is timbered with fir, spruce and cedar.

MOOSE LAKE TOWARDS COW DUNG LAKE, 14 MILES.

The valley for 6 miles along the north side of the lake, is flat, about 200 yards in width. Thence to the east end of the lake, or for two miles some slate rock points approach near to the lake; beyond these are large meadows of wild hay; thence for six or seven miles the valley diminishes in width, from $1\frac{1}{2}$ to 1 mile, is quite flat and boggy, and interspersed with a number of small meadows; is wooded with firs and spruce. The stream is sluggish, and from the west end of the lake, is very favorable for boating.

I shall now proceed to give an epitome of the progress of party **R** under the charge of James A. Mahood. This party was assigned the duty of exploring the country, between Quesnel Mouth and Tete Jaune Cache by the Fraser River route.

The difficulty of getting boats, and the loss of time, that must in consequence have occurred at Quesnel Mouth, together with the favourable report of Messrs. Black and Fenton, and other information gathered at Cariboo, regarding the country between Richfield and Tête Jaune Cache, caused the abandonment of the route by the Fraser River and the adoption of the exploration via Richfield and Tête Jaune Cache.

The party—twenty-two men, staff included—left Barkerville on the 23rd August, taking along to carry supplies, a pack train of thirty-two animals; in addition to which Messrs. Barns & Black were engaged for the same purpose, these parties possessing the only pack train in that section of the country.

From Barkerville to Bear Lake, twenty-two miles—an old trail had to be partially opened—this route was selected instead of the one by Antler Creek, because it was thought to afford better facilities for the passage of trains.

From Bear Lake the party proceeded to Indian Point Lake, thence

around the north and east side of Big Lake to its outlet, thence up Swamp River through "Dominion Pass" to its head, thence by the Castle River towards Fraser River. In the report of Messrs. Black and Fenton reference is made to Dominion Pass.

From Bear Lake to Dominion Pass the difficulties of trail making were very great; the greater part of the distance was through a dense forest, in some places the trail had to be corduroyed, in other places a passage for the animals had to be made by pick and shovel on the rocky hill sides; mountain torrents and ravines had to be spanned by bridges. Pushing along, despite the innumerable difficulties that beset the way, the party reached the hoped-for pass, which high and glacier-capped, towered up in front of them, as if to crush out hope and defy further progress. For the animals a passage over it had to be cut with picks and axes, and on the 29th of September the party emerged from Dominion Pass. At this point the packers became afraid of being cut off by snows, and threatened to desert the stores and return to Cariboo. Fortunately they were persuaded to remain, otherwise the effort to reach the valley of the Fraser River must have been abandoned. The progress of the party was now much impeded by snow storms which were almost continuous from the 5th to the 10th of October. The Fraser River was eventually reached on the 20th of November, and the party encamped for the winter. After making the best possible disposition of the supplies, Mr. Mahood started for Barkerville on the 4th of December, which was distant one hundred miles, and arrived there in twelve days; from thence he continued his journey to Victoria, where he arrived on the 12th of January 1872.

This route presents two almost insurmountable obstacles to the construction of a railway. The country from Fraser river at Quesnel, Mouth to the Dominion Pass, could be traversed at easy grades—that portion lying between Big Lake and Swamp river, would be exposed to snow slides or avalanches that in their courses irresistibly sweep rocks and trees before them, and make as it were a series of avenues through the forest, on the mountain slopes. In going from the forks of Swamp river over the Pass into the head waters of Castle river, a rise and fall of two thousand three hundred feet has to be overcome in a distance of twelve miles. The glacier previously referred to is at the highest point—is half a mile in extent and about two hundred feet thick. To grade up to, or over this glacier would be an impossibility, its passage would therefore involve the making of a tunnel of such length, as to render this route unworthy of further consideration. Mr. Mahood and party before leaving their winter quarters will make further explorations to ascertain if a practicable pass can be found through the Selkirk range. They will also explore the country between Quesnel Lake and the Cariboo fork of the North Thompson River.

The route from the Yellow Head Pass, crossing Canoe river by Albrede Lake, thence along the valley of the north Thompson River, is singularly favorable for the construction of a line of railway, of easy

gradients, and moderate curves, and in addition comparatively light work (see table of grades, of the different sections of those streams.) On this line no grades will exceed fifty feet per mile, and for great distances will range from fifteen to twenty five feet per mile, which will allow for some undulations in rising or falling, to follow the benches or terraces in the different valleys. In many places stone for second class masonry is plentiful, and I have no doubt but further examinations will lead to the discovery of stone of a better quality, and the finest and largest timber in the interior of British Columbia, abounds along these valleys. The parallels inclosed in the foregoing report, embrace a very large portion of the farming and grazing lands of British Columbia, pass near to, or through parts of the richest gold regions, as well as the best timbered portions of the interior, in the latter of which the Thompson River undoubtedly excels.

From the best information I could obtain, the present winter set in earlier and with greater rigor than it did for more than ten years before. I have lately been informed that Indian hunters say they never saw or heard of such a winter; this, though an impediment to our operations and fatal to many of our pack animals, must still be accepted, as in some degree, a fortunate circumstance, it enabled us, in the outset, to acquire a knowledge of the most severe weather likely to be experienced. The parties are instructed to note particularly the maximum and minimum temperature, the depth of snow at the water sheds, and all necessary information bearing on the subject.

Accompanying this report please find tables of the inclinations of the different sections of the streams on the route of my explorations. These will indicate, approximately, the gradients; an actual line may, however, shew a lighter grade from the Grand Forks of the Fraser River to Moose Lake; on the whole, this line throughout, will be one of easy grades.

I have herein endeavored briefly to give you the salient points of the explorations, and I entertain the belief that a more detailed examination now being carried on, will corroborate what has been said.

Referring to a previous statement where it was said the severity of the winter had been fatal to the animals of the pack trains, I may, in connection therewith, say, that the total loss was 86 animals—24 of these belonged to party B, and the remainder to party C. Many died on the outward journey from cold, hunger, or overwork in travelling over a country which the incessant rains had made almost impassable, the majority, however, were either abandoned or perished in the snow storms, which were almost continuous on the home journey. In prosecuting the work another season, the trains will, in a great measure, be exempt from losses, that this summer were unavoidable. A good trail is now opened, and the grazing grounds are better known, so that the movement of trains will be greatly facilitated, and the work finished earlier in the season. I may add that supplies, nearly sufficient for two parties for ten months, are stored on the route, depots being established at Clear Water, 70 miles above Kamloops, at North Forks, 176 miles from the latter place, and at

Mr. Green's camp, Canoe River. It is intended to make the North Thompson the principal base of supplies for the summer operations, as from Tête Jaune Cache, supplies can be distributed toward Quesnel Lake—if a pass is found there—down the Fraser River or along the Thompson.

It gives me pleasure to be able to state that good feeling generally prevailed among the staff and men of both parties. The inclemency of the weather, the density of the forests to be penetrated, and the character of the country travelled over, entailed hardships not usually endured on railway surveys. Notwithstanding these and the other difficulties of the service, the "esprit de corps" of the parties, except in one or two instances was excellent throughout.

I have the honour to be

Your obedient Servant,

R. McLENNAN.

TABLE of the grades on the following sections of the North Thompson, Canoe and Fraser Rivers:—

DESCRIPTION OF SECTION.	Miles.	Feet per mile.	Ascent.	Approx. Altitude in feet.	REMARKS.
Kamloops Lake.....				1100	Above the Sea.
Kamloops to Clear Water River.....	70	5.78	405	1505	
Clear Water to Mud River.....	26	11.34	295	1800	
Mud River to Salmon River.....	25	10.00	250	2050	10 miles of smooth water.
Salmon River to Blue River.....	25	8.00	200	2250	
Blue River to North Fork.....	30	3.33	100	2350	Or river crossing.
North Fork to Albreda Lake.....	13	37.30	485	2835	Water shed.
Albreda Lake.....	12	Level.			
Albreda Lake to Canoe River.....	12	28.75	*845	2490	*Descent.
Canoe River to Tête Jaune Cache.....	13	5.38	70	2560	Across a valley.
Tête Jaune Cache to the Grand Forks of the Fraser River.....	10	13.00	130	2690	See section.
Grand Forks to Moose Lake.....	14	64.28	900	3590	
Moose Lake.....	8	Level.			
Moose Lake to Water Shed.....	20	8.50	170	3760	Summit of Yellow Head Pass.
	207½				

N. B.—These altitudes were obtained from a mean of a number of readings taken with a Compensated Aneroid Barometer. From Albreda Lake to Canoe River it has been ascertained by a line of levels that the grades will not exceed 23 feet per mile, and from Tête Jaune Cache to Moose Lake a grade of fifty feet per mile can be had.

APPENDIX No. 5.

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(Report on the examinations made between Fort Garry and the Rocky Mountains—Frank Moberly, Esq., in charge of the Expedition.)

SANDFORD FLEMING, Esq.,

Engineer-in-Chief, C. P. R.

Ottawa, April, 1872.

SIR,—In accordance with instructions received from you in June last, I proceeded as rapidly as possible to Fort Garry, where I completed my outfit and commenced the exploration on the 4th August, following as near as possible the red line indicated on the map accompanying your instructions, along the Assiniboine to Fort Pelly then past north side of Quil Lake across south Saskatchewan in latitude N. 52° 22' 12," thence west to the north Saskatchewan which we followed to a point about sixty miles above Battle river. A westerly course was then taken to the Hay lakes, we then left the line and proceeded northerly to Edmonton, where we arrived on the 16th Oct. The following notes are extracts from the diary kept on this portion of the line :

"From Fort Garry to third crossing of White Mud river (Palestine) a distance of 96 miles, the country is a perfectly even prairie with no large streams or gullies, soil rich, clay and clay loam; there is some fine oak, elm, maple and poplar.

"From third crossing of White Mud to the Little Saskatchewan, a distance of 49 miles, the rise to second Prairie Steppe (or Riding Mountains) is made; the country is very much broken by sand and gravel ridges and is thickly wooded with small poplar.

The Little Saskatchewan valley is the first obstacle of any importance, it is 5,000 feet wide, 184 feet deep and has no lateral valleys of any length.

From Little Saskatchewan to Bird Tail creek, a distance of 58 miles, country is rather rolling with small alkaline ponds in hollows, soil gravelly.

The valley of Bird Tail creek is 3400 feet wide, and 140 feet deep; it also has lateral gullies.

From Bird Tail creek to Shell river, a distance of 38 miles, the country is rolling, getting rougher as you go back from Assiniboine; there are also great numbers of small lakes and ponds, plenty of small poplar, soil clay and gravel. The valley of Shell river is 3700 feet wide, and is 284 feet in depth and would be very difficult to cross. From Shell river to Fort Pelly, a distance of 73 miles, the country is rolling and there are two small creek valleys and a couple of swamps to cross, the soil is generally light and in the neighbourhood of Pelly, very sandy. Some small spruce and tamarac.

The country from White Mud river to Fort Pelly is not favorable for settlement, the soil being generally light, a good deal of the water alkaline, summer frosts frequent.

From Fort Pelly to south Saskatchewan, a distance of 226 miles, the country is rather rolling until we approach the river, where for 25 or 30 miles, a succession of ridges rise to about 80 or 100 feet, but these have easy slopes and numbers of openings; on this part of the line we passed several large lakes, the largest being Quill lake, which is from 30 to 35 miles in length; and the water is so alkaline as to be unfit for use. Soil is principally clay and sandy loam with great numbers of boulders; the water in all the running streams is invariably fresh and good; very little timber.

A comparatively easy crossing of the south Saskatchewan was found at Lat. $52^{\circ} 22' 12''$ at this point the approach to the river is easy and from 50 to 60 feet above the level of the water which at mid-stream was about ten feet deep. The bridges will probably require to be 1400 feet long; banks and bottom are sand mixed with large gravel and boulders.

After crossing the south Saskatchewan we continued on a westerly course to the elbow of the north Saskatchewan, passing it on the southerly bank. From south Branch to Eagle creek, a distance of 47 miles, the country is perfectly level, with no timber, soil sandy loam: Eagle creek can be crossed easily near its mouth.

From Eagle creek to Battle river, a distance of 50 miles, the line runs along north end of Eagle hills, there is, however, a plateau which follows the river and affords a good chance for location, except for about six miles which will have to be on steep side hill.

At the mouth of Battle river there is a flat which is about 5 miles long and about 1 mile in width, and is 12 or 15 feet above the river giving a capital chance to cross it. The river was only 75 feet wide when we crossed and did not show signs of being subject to heavy floods. Soil sandy loam with gravel in places and a good many sand-hills near the mouth. There is plenty of birch and poplar on the Eagle hills.

From Battle river, for a distance of 64 miles, no difficulties will be met with. Soil principally sandy loam, with some sand knolls. No timber.

From the above point for a distance of 84 miles the country is cut up, in every direction by ranges of hills and buttes, the highest points being probably 300 or 400 feet above general level, there are plenty of low divides in all the higher ranges, and I think it would not be necessary to use any grade exceeding 50 or 60 feet per mile on this portion of the line; although it will necessarily be rather crooked. Soil clay and sandy loam with gravel ridges and a great many boulders; not much wood and a great want of water.

For a distance of 63 miles to foot of Beaver hill, nearly a level plain, no obstruction; soil exceedingly fine, sandy loam, plenty of good water and small timber.

From foot of the Beaver hills to Hay lakes, a distance of 20 miles, the country is cut up by low ridges with a great number of Beaver ponds and marshes in hollows. It is also thickly covered with small bushy poplar.

The rise to the top of the hills is long and very gentle."

On reaching Edmonton, as the season was so far advanced, I concluded to send Mr. Nichol back in charge of the main party, hoping that horses would reach Fort Garry before winter, at the same time giving him instructions to proceed along north bank of Saskatchewan to Carleton and to examine the country in that direction, then to follow the cart road to Quill lake: at the latter point he was to divide his party sending one portion in charge of Mr. Ermatinger to Fort Garry by the south bank of Assiniboine, and taking charge of the other portion himself, to cross by a depression in the Duck Mountains and examine the country lying to the north of Duck and Riding Mountains as far as mouth of White Mud river.

The fire having run through the prairie late in the fall this party lost a number of their horses, it being impossible to get any food for them.

Immediately after Mr. Nichol left I started for the Howse Pass, having to take the route by the Rocky Mountain House and then follow the Saskatchewan into the Mountains I reached the Kootanie Plains on the 11th November. After searching without success for traces of the party from the west of the Mountains I explored the country lying between the Kootanie Plain and the branches of Brazeau river leading between the Brazeau and Big Horn ranges of mountains where I found there would be little difficulty in locating a line, the fall of the streams being very gentle, however after reaching the main stream of the Brazeau river considerable difficulty would I think be met, as the valley is very crooked with high precipitous banks and besides which a very broken and rugged country covered in many places by large and deep muskegs would have to be crossed and great difficulty would also be experienced in either getting round or through the Brazeau mountains: I gained a good deal of information respecting the country from miners who had been along the river prospecting and my own observations confirmed what I then learnt.

On reaching the main branch I found it would be impossible to follow it without cutting a trail on account of an almost continuous windfall, by this time the snow was nearly a foot deep and as our horses were beginning to show signs of giving out I was compelled to return to the Rocky Mountain House, whence after procuring a train of dogs I set off for Buck lake intending to examine the country between it and the mouth of Brazeau river. We were however misled by our guide and finally had to push on to Edmonton for supplies arriving there on the 11th December, having been six days on very short rations.

On the 20th December after dividing the party and sending part in charge of Mr. Horetzki, to make the necessary examinations to Jasper House, I again started for the mouth of Brazeau river examining country from the Beave. hills by way of Pigeon and Bull lakes, reaching that point on the 29th December. This part of the country I found pretty level except two or three small ranges of hills in the neighbourhood of the lakes. In the portion lying to south-west and west of Pigeon lake there is a very considerable quantity of good spruce.

On reaching the junction of Brazeau and Saskatchewan rivers, I found that it would be an exceedingly difficult matter to get a line across the Saskatchewan and up the Brazeau river as they both run through wide valleys with precipitous banks of sandstone from 150 to 200 feet in height with flats alternately on each side and opposite these the banks generally rise to their full height from the waters edge.

I then returned to Edmonton by way of Lake St. Ann, and found that between those points an excellent line can be obtained by following the valley of Sturgeon River.

Of the country between Lake St. Ann and Jasper House, I copy the following from Mr. Horetzki's report:—

"From Lake St. Ann to Pembina River, the country is level but knolly in places, especially at west end of Lac des Isles, here the land rises, but not abruptly, to the summit of the divide between the Saskatchewan and McKenzie Rivers, this divide is 250 feet above the level of Edmonton House. The descent from this point to the river is pretty sudden. The Pembina River valley is rather deep and wide at the crossing of the Horse trail, but higher up there are many places where it can be easily bridged. At the crossing the river is 225 feet wide, fordable, with good bottom; extensive coal seams crop out sometimes near the water's edge and again higher up on the banks; these seams are on fire in several places, and flames can be seen at night, the odour of burning coal is distinctly perceived.

From Pembina River to McLeod River it is generally level, and in places swampy; at the divide between the two rivers, the country becomes hilly and rough, especially near Moose Camp.

A couple of miles west of Moose River the trail crosses the Root River, a small tributary of the McLeod. From this point a good horse trail exists to Jasper House. My guide tells me it is almost a direct line for the south end of Lac Brulé, passes over a sandy country, crosses only two small swamps and the McLeod River twice, and is altogether an excellent road. No hills are to be met with and the descent to the river is gradual and easy.

The Company's trail follows up the River for 33 miles, then crosses a

Portage of 12 miles in length, follows the McLeod again for 14 miles, and finally takes the Portage to the Athabasca, which is about 13 miles in length.

The McLeod is a pretty large stream from 240 to 270 feet wide in places, and flows between Sandstone banks; these banks are often 80 to 100 feet in height. This River is fordable in places, and contains Gold. No coal was seen.

From the McLeod to the Athabasca, the portage is pretty thickly wooded and rough; the descent to the Athabasca river is steep: I should say the descent of the valley to be 250 feet deep, where we struck the river.

From the Portage (5 miles below the Grand Bas fonds,) the river was followed for 25 miles to the entrance of Lac Brulé; the river is wide and rapid, being from 160 to 420 ft. in width. Several rapids are met with, especially a few miles below the Lake; the banks are high, and the approach to the river difficult, excepting just below the Rivière de Prairie, where the banks descend very gradually. This Lake is about 8 miles in length, and 1 mile wide; it is shallow with sandy bottom, the banks on the eastern side are low, 30 to 40 ft., and of sand; at the South East end, these banks descend very easily to the water's edge, and it is at this point that the road alluded to before, touches the Athabasca. The Lake terminates here, and this may be called the entrance of the Mountains, the Athabasca here turns to the South West, and by following it up ten miles further, Jasper House is reached.

At the base of the mountains there is a fine wide level flat of light sandy soil, where the road can easily be carried to a point or spur of the Roche a Miette, here the river would have to be crossed as the rock is washed by the river; the true channel is not wide at this point (about 210 feet) but the river bed cannot be less than 750 wide, all dry at this time of the year with the exception of the channel, and has a good hard gravelly bottom; after crossing to the other side, a fine level prairie is reached, being that upon which Jasper House is situated.

During the summer months the river rises 5 or 6 feet higher than at this season, but never overflows the prairie on which the house stands, or the Bas fonds which lies along base of mountains.

I should advise that an explorer be sent next summer to go over the country lying between the Pembina and Root River; that another should commence his investigations from Eoot River to Lac Brulé; the person going in at the Pembina should begin, say 8 to 10 miles, above the usual crossing place and follow up the ridge which runs from the Pembina to the height of land between that river and the McLeod. I believe these ridges offer a good route for a railway; south of it, I am told the country is a vast swamp.

As regards that part of the proposed route between Root River and Lac Brulé, I am convinced that it presents extraordinary facilities for a road."

All the necessary explorations to the west of Edmonton, except that entrusted to Mr. Horetzki, having been completed, I started on my return trip to Fort Garry, on the 16th January, by way of Lac la Biche, a point about 100 miles north of the north Saskatchewan; then to Fort Pitt, Carlton, Fort a la Corne and Fort Pelly.

In order to gain as much knowledge as possible of the country along the valley of the Swan river and extending east of the Duck and Riding mountains, I started from Fort Pelly for Swan Lake and then proceeded along the side of Lake Winnipegosis to Manitoba House, and arrived at Fort Garry on the 10th March.

Mr. Nichol having had the most favorable opportunity of examining the line between Edmonton and Carlton north of the river, I will give the following extracts from his notes:—

"The country lying north of the North Saskatchewan and east from Edmonton to the Vermilion River, a distance of 37 miles, is almost level, it is thickly timbered in places, with spruce, poplar, and birch of a good quality; the soil is a black sandy loam, it is drained by the Sturgeon and Vermilion rivers, emptying into the Saskatchewan; these streams are about 50 feet wide, clear and rapid, with gravel bottoms; the valleys are from 50 to 75 feet under the general level and are about 500 feet wide.

"The country from Vermilion River to English River, a distance of 182 miles, is all broken by hills rising from 100 to 200 feet on an average, and in the neighborhood of Fort Pitt the Red Deer Hills are from 400 to 500 feet high; there are numerous small lakes, the largest of which are Saddle and Egg lakes; in the immediate vicinity of the lakes the country is flat, extending back for a few miles; the soil on the hills is light sand and gravel, and in the valleys sandy loam; there are great numbers of limestone and granite boulders near the English River; there are groves of small poplar on this part of the line, and on the banks of streams some spruce is found; this part of the country is drained by flowing creeks and rivers; Carp creek 30 feet wide, and its valley 50 feet deep and 500 feet wide; Round Butte creek about the same size; White Mud river 50 feet wide valley from 75 to 100 feet deep, and half a mile in width; Saddle river is 60, feet wide, and its banks only a few feet high; Dog Rump creek 30 feet wide, west bank steep and over 150 feet high, east bank an easy slope, the distance across valley is about one mile; Moose creek 20 feet wide, the valley banks steep and from 150 to 175 feet high, width half a mile; Middle creek same size as Moose creek; Red Deer river 25 feet wide and running in a fine broad valley on west side of the Red Deer hills; English River 15 feet wide, very crooked, winding round among the hills in a narrow valley.

From English River to Carlton, a distance of 128 miles, the country is broken by ranges of hills from 150 to 200 feet high, with broad and nearly level valleys between them; soil in valleys sandy loam, the only timber is some small groves of poplar.

In the thickwood hills, from 20 to 40 miles west of Carlton, there are numerous small lakes, the largest having an approximate area of 35 square miles; the width of the Saskatchewan at Carlton is 1,200 feet, the valley is a mile wide with steep banks about 200 feet high."

From Carlton I had an opportunity of examining the river for myself as far as Fort a la Corne, but did not succeed in finding any favourable place to cross, the valley being very similar to that already described at the mouth of Brazeau River, except that no rock is visible in the banks.

From Fort a la Corne to Fort Pelly, the country is thickly wooded and rolling in places, but no obstacles of importance are met with. From the level of Fort Pelly there is no difficulty in descending by the valley of Swan River to the low ground east of the Duck Mountains; From Swan river, the country lying north of Duck and Riding mountains, was found, on examination, to be nearly level, thickly wooded with spruce, poplar, and some maple, a few small lakes and marshes were also found; soil, sandy loam, and admirably fitted for farming.

Mr. Ermatinger's examination from Touchwood Hills to Fort Ellice and Souris River, shewed that the bridging of all the streams in that direction would be very great, and there would be no advantage gained by carrying the railway along the general direction of the Assiniboine.

Generally speaking the country extending from about Fort Pelly by Swan River, and between the Riding Mountains and Lake Manitoba, to Prairie Portage near Fort Garry, is for the most part well wooded and the soil of excellent quality.

Having now completed a general examination of the several routes indicated by you, I am satisfied from what I have seen and learned, that the most eligible route for a railway will be found to extend from Fort Garry to the north of Duck Mountains, passing between the Thunder and Porcupine Hills, crossing the south Saskatchewan in latitude $52^{\circ} 22' 12''$, and following south bank of north Saskatchewan to a point about 60 miles above the mouth of Battle River, thence by way of Beaver Lakes, Edmonton, and Lake St. Ann's to Jasper House; by taking this line the bridging of the wide and deep valleys running back from the Assiniboine, and of which I have furnished sections, would be avoided, and both branches of the Saskatchewan would be crossed at the most favourable points known, the rough country lying to the north of the North Saskatchewan, and east of Edmonton, would also be avoided, besides which the line would pass through a larger portion of country favourable for settlement, than other projected lines.

The only timber of much value is spruce which is found in groves along the flats of the North Saskatchewan west of longitude 112° and about the Pigeon and Buck lakes, and from Carlton House downwards, but the quantity is greatly lessened each year by the prairie fires spreading into the thickwoods.

I send herewith samples of grain, &c., raised at different points on the Saskatchewan each labelled with the name of the settlement at which it was procured, and also specimens of coal and gold from Edmonton. Coal is seen on the banks of the Saskatchewan from Edmonton to Rocky Mountain House, the seams vary in thickness from two to nine feet.

When the location surveys are commenced it will be necessary to open a trail or cart road along the north side of Duck and Riding mountains and as far down as Quill lake, and also to improve the trail from lake St. Ann's to Jasper House.

One of the principal features of the lakes along the Saskatchewan are the immense numbers of white fish in them, which although of a smaller size than those caught in lakes Huron and Superior, are equally good in flavor; at lake St. Ann's 200,000 have been taken in a season, and at Pigeon Lake 100,000 have been taken in the same period, these are two of the principal fisheries.

The country lying westward from the Forks of the Saskatchewan to Edmonton and from the Battle River, north to the Pelican Lake, and Lac la Biche; and also the country lying adjacent to the Red Deer River, is nearly all admirably adapted for agricultural purposes; and although the portions now under cultivation, are invariably the low and sour flats along the rivers and lakes, I have seen some very fine crops of Wheat, Barley and Potatoes, and am convinced that if the Uplands were used the results would be still more favorable.

The total distance travelled in the country west of Fort Garry, was 5,900 miles, and it was my special object, to avoid travelling over the same road twice, in order to gain as much information as possible respecting the Country.

I am pretty thoroughly convinced, that Surveying Parties carrying on their work in the ordinary way, would meet with no opposition from the Indians along the route.

I must also mention that we would have suffered very great inconvenience, but for the kindness experienced at the hands of the Officers of the Hudson's Bay Company, who did everything in their power to assist us.

In conclusion, I must thank Mr. Nichol, Mr. Horetzki, and Mr. Ermatinger for their able assistance in carrying out your instructions, and for the willing and cheerful manner in which they endured the many hardships we had to encounter.

I have the honor to be,

Sir,

Your most Obedt. Servt.,

FRANK MOBERLY,

Engnr. in Charge Exptd. O. & P.

APPENDIX No. 6.

(Report of James H. Rowan, Esq., on the progress in the Surveys between the valley of the River Ottawa and Fort Garry.)

OTTAWA, April 1872.

SANDFORD FLEMING, ESQ.,

Engineer in Chief, C. P. R.,

SIR,—I have the honor to submit the following report, in reference to that portion of the Canadian Pacific Railway Survey, extending from Mattawa to Red River, a distance of about 900 miles, which you were pleased to entrust to me.

Three parties (B. C. and D.) under Messrs. Lloyd, O'Hanley and Austin, who were charged with the duty of exploring northward and westward from Mattawa, for a distance of about 250 miles, left Ottawa and ascended the Ottawa river to the point named, on the 10th of June last. I started on the evening of the 15th with a portion of the staff of the other eight parties (E. to M. inclusive) for Toronto, where the remainder were instructed to meet me, and arriving there on the afternoon of the 16th was joined by the rest of the staff.

The remainder of that day was spent in organization, arranging commissariat matters and procuring some men. On the morning of the 17th I sent off a portion of the staff and men to Collingwood, the remainder in the afternoon, while I remained in Toronto until Monday, the 19th, (arranging various details with Mr. Wallace, the head of the Commissariat) then started for the same place and arriving there that evening found the Engineers, in obedience to my instructions, had been hiring Axe and Packmen for their respective parties. It was found, however, impossible to obtain either the large number or class of men required, and many of those we were obliged to take, subsequent events proved, were unequal to the very arduous labor they had to undergo, causing very considerable delay and difficulty in pushing on the work.

Tuesday, the 20th of June, the steamer *Algoma* arrived from Thunder Bay, and the afternoon was spent in getting the supplies on board of her and the *Rescue*, one of the Government gun boats which had been obtained from the Militia Department, for the purpose of landing some of the parties on the north shore of Lake Superior, at points where it was thought the mail steamer would not call. As the time drew near for the boat to leave, it was found that the carrying capacity of the Gun boat was much less than had been anticipated, the consequence was that most of the men had to be taken on board the *Algoma*; the larger portion of the stores for Michipicoton, Pic and Nipigon being placed on board the former.

Owing to the great addition thus made to the usual number of travellers on the Mail steamer, great crowding and inconvenience was experienced.

The *Algoma* started from Collingwood at 9:30 p. m., on the 20th of June, the *Rescue* following shortly afterwards, and arrived at the Sault Ste. Marie, on the 22nd of June, at 11 a. m.

Fearing that it would be difficult if not impossible to obtain canoes of the requisite size and in sufficient numbers, at the points where they would be required, I endeavoured to procure some at Collingwood and every point where the steamer stopped, and by this means obtained seven before reaching Michipicoton on Lake Superior. It was fortunate that I had taken this precaution, for none were to be had at the H. B. Posts, where we afterwards made our depots, as they never keep a stock on hand; to obtain them it would be necessary to give the order a year before, in order that the Indians might have time to procure bark from the interior of the country.

Leaving the Sault in the afternoon of the same day, we arrived off Michipicoton, on Lake Superior, at 8 o'clock, on the morning of the 23rd, we had utilized the time occupied in coming here, in getting the supplies for each party collected together, this, owing to the hurried manner in which they had been put on board and the crowded state of the boat, as already explained, was a work of great difficulty.

There are no landing places for large craft at any point on the north shore of Lake Superior, consequently the two parties, (E. and F.) in charge of Messrs. Gamsby and McConnell, together with their stores, had to be landed in the steamer's boats and a *bateau* kindly lent for that purpose by Mr. Bell, the H. B. Co.'s officer at Michipicoton, the *Rescue* coming up shortly afterwards, commenced to land supplies in the same manner. I went ashore with the parties and had a short interview with Mr. Bell, who kindly promised every assistance in his power to forward the undertaking, which promise he fulfilled. Owing to the exposed position of the place and anxiety on the part of the Captain to continue his trip, the length of my stay was shorter than I could have wished. No canoes of the size required were here to be obtained, as it seemed extremely doubtful if any could be procured. I left four, being all I could spare, of those I brought with me. A larger number was, however, requisite for the expedition's transport of the supplies.

Leaving Michipicoton we steamed for Pic, which point we reached at 2:30 a. m., on the 24th June, and proceeded to land party F, in charge of Mr. Armstrong, in the same manner as the others had been landed at Michipicoton; but the difficulties to be contended with here were even greater than at the former place, as the position is much exposed to seas from the lake, and at that early hour (2:30 a. m.) it was quite dark. The *Rescue* came in sight just as day began to break and we were leaving. There were no canoes to be obtained so I gave the party the three remaining on board the Steamer.

Leaving Pic at day light we arrived at Nepigon at 8 p. m. the same

day and landed party H in charge of Mr. Johnston; most of their supplies being on board the *Rescue*, and the *Algoma* being able to come along side the wharf, our detention here was short. There were no large canoes to be obtained, but the distance from the landing place to the point where the party were to commence work being comparatively short, they succeeded, with some trouble and delay, in getting their supplies up.

The *Rescue* was not in sight when we left for Thunder Bay, at which point we arrived on the morning of the 25th of June and immediately commenced to land the men and supplies; this together with getting the latter into store and finding accommodation for the parties, (tents being on board the *Rescue*) occupied the entire day.

As it was of the first importance to ascertain at once, what canoes could be procured to convey to their destinations the men, and supplies of the four parties, who were to explore the country between Nepigon and Red River, I crossed the bay from Prince Arthur's landing to the H. B. Post, (Fort William) early the following morning, and saw Mr. McIntyre, the officer in charge, who kindly promised me every assistance in procuring canoes and Indians to man them; to his kind assistance I was much indebted for success in these matters.

Finding that it would take some days to get canoes ready, I returned to the Landing to make arrangements for forwarding the men and supplies over a portion of the "Dawson Route" to Red River. During my absence at the Fort, the steamer *Rescue* arrived at the Landing, and the supplies, tents, &c., were being landed.

At this time I was met by a difficulty which retarded very materially the progress of the work. Mr. Dawson, the Engineer in charge, under the Department of Public Works, of the route to Red River, was absent with Mr. Simpson, arranging a treaty with the Indians, at Fort Francis. Owing to this, and the fact that all the available force on the route was engaged, in forwarding supplies for the use of the troops, about to return from Red River, and for immigrants proceeding to that point, we were unable to obtain waggons and horses to forward our supplies, except in detached numbers and at different intervals of time, consequently it was the 5th July before the first of our parties and the 15th before the last had left the landing.

On the 27th June I had been to Fort William pushing forward the construction of canoes, engaging Indians, &c., and on my return to the Landing in the afternoon, found the place in the greatest state of confusion; the fires, which had been raging in the woods for some time, fanned by a storm from the south-west, had extended to the Government Depot at this point; all the tents of our parties were levelled by the storm, and had it not been for the active exertions of the heads of our parties, assisted by the men, the whole of the Government property would have been destroyed, the number of men on the spot connected with the works being

too small to battle with the flames. Mr. L. Russell, Mr. Dawson's Assistant on the works, returned this afternoon from Fort Francis and informed me that great damage had been done by the fire at various points along the route; he also stated that he thought it would be unsafe for our parties, especially for those going to the neighbourhood of the Lake of the Woods, to enter the woods for some time or until an arrangement had been made with the Indians at Fort Francis.

By the close of the week we were all ready to start, and would have pushed forward but for the reasons already given; we continued, however, to push forward supplies as fast as means of transport were available, but I kept all the parties (with the exception of a few men sent to take care of the supplies at Kaministiquia Bridge and Shebandowan Lake) at the Landing, it being cheaper to board them there, than further inland. The time occupied in forwarding the supplies was utilized by the Engineers taking their respective parties into the woods, in the neighbourhood of the Landing, and practising them at the work they would have to perform when on the actual exploration.

Most of the supplies for parties **I** and **K**, having been forwarded to the Kaministiquia Bridge, I started three loaded canoes, manned by Indians, by the river for that point on the 1st of July, and on the 5th, party **K** in charge of Mr. Carre, started to walk there at 3 a.m., the distance by the "Dawson Road" being 21 miles; on the morning of the 7th, party **I** in charge of Mr. J. Fleming, followed; arriving there myself in the afternoon I found the two parties and the Indians, who brought up the canoes, all encamped. The following morning (8th July), five canoes loaded with supplies, twenty-two men, and twenty Indians, started for the Great Dog Portage, where the supplies were landed; and while the men were engaged in transporting them across, the Indians returned with the canoes for the remainder of the supplies and parties. In this manner they moved along until their destination (about 100 miles from the Landing) was reached, so great, however, were the difficulties of transport encountered on the way, that it was the 27th of July before work was actually begun.

Parties **I** and **K** being now fairly under weigh, I returned to the Landing to start the two remaining, (**L** and **M**) in charge respectively of Messrs. James and Jaryis, to Shebandowan Lake. This being effected, I ascended the Kaministiquia River to the head of the Great Dog Portage, where I found the rear of the supplies for parties **I** and **K** and the Commissariat officer, the Engineers having gone forward with the balance. Having given final instructions to the Commissariat officers, I returned to the Bridge, and from thence I took the "Dawson Road" to Shebandowan Lake, arriving at noon on the 18th; here I found parties **L** and **M** encamped, they having come through on foot from the Landing in two days, the distance being 47 miles. After seeing everything prepared for a start from that point, so soon as boats could be supplied by Mr. Dawson, I left

Shebandowan that evening and arrived at the Landing the following morning, in time to take the steamer *Chicora* for Collingwood.

On the trip down the Lake we called at Nepigon (21st July) where I learned that party **II** was making favourable progress; we reached Collingwood at 6 a.m., 24th July, and I arrived in Ottawa the evening of the 26th. Here I reported myself to you, and having received instructions to keep four parties at work during the winter, returned to Toronto, met the Commissariat Officer, Mr. Wallace, and arranged that warm clothing, snow-shoes, additional blankets &c., should be procured, and forwarded for the use of these parties. From this gentleman I learned that during my absence at Thunder Bay, one of the parties (**II**) north of Lake Superior, had lost most of their supplies by fire in the woods; steps were, consequently, taken to repair this loss.

I again sailed from Collingwood on the 10th August, and reached Thunder Bay on the evening of the 14th; the *Rescue* had arrived the day previous having delivered a second supply of necessities at the depots on the north shore of Lake Superior. By her I received the distressing intelligence of the loss of some men, by fire in the woods, belonging to party **II**; this made me extremely anxious to visit that party and all the others along the north shore. Finding that this could be effected more satisfactorily by taking the *Rescue* than by waiting for the regular line of steamers, (whose visits to the posts on the north shore, at this advanced season of the year were very irregular) I altered the arrangement, made at Ottawa, of sending her home after this trip to Thunder Bay; and arranged she should take me to Nepigon, Pic, and Michipicoten, and after landing me at the latter place should then proceed to Collingwood and be paid off.

Before leaving Thunder Bay I learned, that owing to the great difficulty of getting in supplies for two parties, by the route they had to follow, party **I** had removed to Nepigon at the other end of their division; I also learned that party **II** had advanced some miles along their route, and found the country generally favourable for Railway construction. I forwarded the instructions to **I** and **II**, in reference to their remaining out all winter; when last heard from, they had not arrived at their starting point.

Leaving Thunder Bay, in the *Rescue*, on the evening of the 16th August, I reached Nepigon the following morning and proceeded along the explored line to the camp of party **I**, a distance of 10 miles. The country passed over thus far being comparatively level and of rather a swampy character, (except in the immediate neighborhood of Nepigon) thickly, but not heavily, wooded with Balsam, Spruce and Cedar.

I returned to the *Rescue* the following day at noon, and proceeded down Nepigon Bay to Jack Fish river, where we arrived at 6 p. m. At this point party **II** had established a depot, thereby saving a portage of 14 miles along the line from Nepigon; here the effects of the fire in the woods were first seen by us, the timber and soil being completely burned up.

Taking a man from the depot and two Indians I had brought with me from the Sault, I started along the line to visit the party; after proceeding about 12 miles we met Mr. Johnston and three men returning to institute a further search for the missing men.

It seems desirable that at this point I should give an account of the circumstances connected with this event, in order to shew that no blame can attach to any one in this matter, except the unfortunate men themselves:—A party of seven men, two whites and five Indians, were detailed from party III to bring forward supplies from one depot to another, (and for this purpose had cut a trail by a shorter route than that followed by the surveyed line) while the main party were proceeding with the exploration; notwithstanding their having been repeatedly urged by Mr. Johnston to push ahead and keep up with the rest of the party, they lagged behind. Their non-appearance, after some days, excited anxiety on the part of Mr. Johnston, who thought they had deserted and returned to Nepigon; he therefore proceeded there himself, in search of them, but found they had not returned; then having fears for their safety, as the whole party had on several occasions, very narrow escapes from the fires, he immediately returned to the main party, and sent his second in command with a number of men to search for the others. After an absence of five days they returned, having made an extensive search and found one Indian and a portion of the woods which had been burned over. He was lying on his face with his shirt, which he had taken off, between it and the ground, placed in that position to exclude the smoke from his lungs; he was not burned, but had evidently died of suffocation caused by the smoke. In a swamp near by were found six holes which had been excavated by the others, in order that by getting into them they might escape the fire, but the smoke becoming too dense had driven them away and no further trace of them could be found. The most extraordinary point in the whole sad event, being that all the supplies, together with their blankets and clothes, were found at the depot untouched by the fire.

The first party sent in search having made these discoveries, returned to Mr. Johnston, who, upon receipt of their report, had, when I met him, as already stated, started to make a final effort for finding some further traces of them.

We therefore, with the men, returned and slept for the night at one of the now deserted depots to which the supplies were being brought when the catastrophe occurred. When the whole party were first encamped at this point they had a very narrow escape, the fire having burned to within one quarter of a mile of the camp, and then leaping over, burned on again beyond, leaving it intact. Leaving Mr. Johnston, the following morning, to prosecute the search (which, I subsequently learned proved useless,) I returned to the *Rescue* and proceeded down the lake to Pic, where we arrived at 8 p.m. on the 20th August.

The progress of this party had been very satisfactory, although the

country passed over proved, for the most part, extremely rugged and broken, in fact entirely impracticable for Railway construction, the distance run at the time of my visit being about 30 miles.

Landing at Pic with my canoe on the morning of the 21st August, I procured some Indians at the Hudson Bay Post and proceeded up the Pic river, reaching the starting point of party C (a distance of 50 miles above the mouth of the river) late in the afternoon of the following day.

This was the point where the supplies were destroyed by fire referred to in an earlier part of this report. The manner in which it occurred was as follows :—The depot was built on a narrow terrace of the river bank, 20 feet above the water, which is succeeded by another terrace of about the same height, immediately in rear of the depot. In this building all the stores of the party were placed, with the exception of a small supply for immediate use in the camp about 10 miles distant. There was a man in charge who slept in the building; about daylight one morning he was awakened by a loud roaring noise, hastily putting on his clothes, he ran out to see the cause and found the whole of the woods on the Upper Plateau, in rear of the building, in flames. The fire was caused by some Indians who had camped there, who, on leaving at daylight, had neglected to extinguish the fire by which they had cooked their breakfast. The storekeeper had only time to roll some few barrels of flour and pork down the bank into the river and betake himself to a canoe, when the whole place was in flames.

The consequence of this was that, for some time the party was reduced to living on fish, which they caught, and some flour kindly lent to them by the H. B. officer at the Pic. As soon as possible, but not until after some time had elapsed, intelligence of the disaster was forwarded to Toronto, and the loss made good with as little delay as possible.

Starting from the Depot early on the 23rd August, with two Indians and one white man, to carry supplies and blankets, we reached the party in the forenoon of the 25th, after a most fatiguing walk of 40 miles. I found the work progressing very favourably although the party had many hardships to contend with, being sometimes reduced to very straightened circumstances as regards food, in consequence of the loss of their supplies by fire, and the great difficulty of transporting them over the rugged country they had traversed.

At the time I visited the party they were supposed to be within 6 or 8 miles of Long lake, at which point Mr. Armstrong, the Engineer in charge, had directed a depot to be made. It subsequently turned out that they had 14 miles of a most difficult country to pass through, which took so long to get over that for some days before reaching the depot they had nothing to eat but a little flour and berries gathered on the hills.

The greater part of the country explored was of the most barren and

rugged description, traversed by high ranges of hills of primitive rock from which every vestige of vegetation had been removed by fire, and quite impracticable for a Railway.

Leaving the party (C) on the morning of the 26th I reached Pic on the 29th, where we were detained on board the *Rescue* in consequence of a storm, the steamer having to take shelter in the lee of an island at some distance from the mouth of the river.

On the morning of the 31st, the weather having moderated to some extent we sailed for Michipicoton, and arrived there in the evening, but, the storm rising again, we were obliged to take shelter under Gros Cap, a point two miles distant from the mouth of the river. By the 3rd September the sea had gone down, and launching my canoe I paddled myself to Michipicoton, the steamer proceeding on her voyage to Collingwood. Mr. Bell, the H. B. officer at this point, procured me with some difficulty, owing to most of them having gone to their hunting grounds, six Indians, with whom I started on the morning of the 4th, by Michipicoton and Moose rivers for the depot of parties E and F on the latter river, and distant from Michipicoton about 150 miles. We arrived at the above named point on the morning of the 8th, where I found that owing to the great distance over which supplies had to be conveyed, the difficulties of the route and scarcity of men, the party (E) were run very short of provisions: stopping therefore only long enough to write a line to Mr. Gamsby, Engineer in charge, I proceeded down Moose river with the intention of visiting New Brunswick House (H. B. Post) and trying to hire some Indians.

As I camped at a portage on the night of the 8th September, I was joined by party N, under Mr. McKenzie, on their way homewards after having ascended the Ottawa river, descended the Abbitibbie to James Bay and ascended the Moose river to this point. From this gentleman I learned that my visit to New Brunswick House would be useless, as when he left it that morning, the H. B. Co. could hardly procure Indians to man their canoe, about to start for Michipicoton for winter supplies. I therefore, in company with party N, the next morning, retraced my way to the Depot, and arriving there in the afternoon immediately despatched one of my Indians with a note to Mr. Gamsby, requesting him to come and meet me at his 15 mile Depot. My object in doing this was to save time, it being very important that I should get back as quickly as possible to Michipicoton, and endeavour by some means to forward more supplies.

Mr. Gamsby joined me at the 15 mile Depot on the evening of the 11th, from him I learned that on two occasions they had been without meat for some days: having received his report on the progress of the work and given him his instructions as to remaining out all winter, I started on my return journey the following morning, to try and find the Commissariat Officer, Mr. Price, who was charged with forwarding supplies for parties E and F, and at this time engaged in taking in supplies to the latter

party, by another route which saved considerable land carriage. At mid-day on the 14th I reached the point on Michipicoton river where this route branched off, and following it met the Commissariat Officer in the evening, on his return from taking in supplies to party F.

Having informed him of the state of affairs on division E, and learned that party F, under Mr. McConnell were getting on satisfactorily, I determined to give up the idea of visiting that gentleman and returned to Michipicoton with the Commissariat Officer. On the way down he explained to me the great difficulties he had to contend with, owing to the scarcity of men, the isolated position in which he was placed, and the consequent difficulty and delay in communicating with the head of his department.

We arrived at Michipicoton at noon on the 16th September, and to my great disappointment, I learned a steamer had left there in the morning, and that some days would elapse before another would call. During this time I succeeded in persuading the Indians, who had taken me up the river, to assist Mr. Price and his men in taking in more supplies, most of them promising to remain with him as long as required. The great difficulty in employing Indians is, to get them to continue for any length of time at a particular class of work. At this juncture our difficulties were materially increased, Mr. Bell, (the H. B. Officer,) having left for Sault Ste. Marie in consequence of ill health, and we consequently lost his valuable assistance.

The steamer *Chicora* arrived on the night of the 20th September bringing what was so much needed, a number of men. I consequently felt satisfied that, with such an energetic officer as we had at this point, the difficulties of getting in supplies, great as they were, would be overcome. I therefore embarked for Collingwood intending to proceed from there to Thunder Bay. Before leaving I wrote to Mr. McConnell, instructing him to stop work and bring out his party on the 10th October, as it was not contemplated to keep them at work all winter, and the risk attending remaining later, unless provided with winter supplies, would be very great.

The country which had been explored (up to the time of my visit) by parties E and F, was on the north side of the height of land, and is favorable for the construction of a railway. The explorations also prove that by moving the line still further north a better section may be obtained.

The *Chicora* arrived at Collingwood on the 23rd September, and in obedience to a telegram from you, I came on to Ottawa and having reported on the progress of the work, was authorized by you to keep Mr. Armstrong and a small party out all winter for the purpose of endeavouring to find a more practicable line further north of Lake Superior than that explored by himself and Mr. Johnston, and also for completing that portion of division F which Mr. McConnell would not have time to finish. I at the same time

received instructions to keep parties **I** and **K** at work during the winter, it being probable that their divisions would not be completed before that time and the expense of keeping them out would be much less than that of bringing them home in the Fall and sending them out again in Spring. The winter is also a much better time for passing through the country to be explored, owing to the fact that the lakes, with which it is covered, are frozen over and more easily crossed, thus rendering the moving of supplies &c. much more practicable.

Having arranged with Mr. Wallace for the forwarding of warm clothing, snowshoes, &c., for these additional winter parties, I again started for Thunder Bay and Lake of the Woods. The *Chicora* called at Michipicoton, Pic, and Nepigon on her way up the lake, thus enabling me to communicate with all our parties. By this means I learned, at Michipicoton, that parties **E** and **F**, were progressing favourably; at Pic I found Mr. Armstrong and party, having completed his division, waiting for a steamer to take them home. When, however, I communicated to them the instructions to remain out all winter, those that were to stay cheerfully undertook to endure the hardship of a winter expedition.

Arriving at Nepigon I found Mr. Johnson and party (having completed their work), and took them on board, in order that they might return to Ottawa. I at the same time sent instructions to Mr. John Fleming, to remain out all winter with his party, and informed him that the necessary winter outfit would arrive by the next steamer.

When we reached Thunder Bay I sent Mr. Carre (**K**) instructions to the same effect, and having arranged with the Commissariat Officer at this point that the winter supplies should be sent in as quickly as possible, I started for Lake of the Woods. Before arriving at this point, however, winter set in unusually early and with such great severity, that I was frozen in on that Lake for three days, and did not reach the "North West Angle" until the 2nd November, after a walk of ten miles on ice hardly strong enough to support my weight, although quite sufficient to stop a boat or canoe.

Here I learned that the Commissariat Officer, Mr. Robson, who had been sending in supplies for parties **L** and **M**, had that morning started for Ottawa via Red River, having completed his work.

Finding there was no prospect of my getting to the Depot of **L** and **M**, at White Fish Bay, until either milder weather returned or the Lake was frozen over, I started for Fort Garry, 110 miles distant. Here I met Mr. Robson, who gave me a detailed account of the difficulties encountered by Messrs. James and Jarvis, parties (**L** and **M**), in getting to their starting point, which they only reached on the 21st August, over two months from the date of their leaving Ottawa.

It being the 5th November when I reached Fort Garry, I directed

Mr. Robson to endeavor to go to Nepigon, by way of Duluth, for the purpose of assisting Division **I** in getting their supplies forward during the winter. Returning to the "North West Angle" with the view of again endeavoring to reach White Fish Bay, I found the ice was not yet strong enough, nor could I succeed in obtaining an Indian guide. After waiting there some days with the above result, I was about to give up the attempt and return to Ottawa, when Mr. James and all the party **L** arrived from White Fish Bay, having travelled on the ice.

From him I learned that the men had refused to continue out any longer, and after an unsuccessful attempt on my part to induce them to continue on the work, I took steps to forward them home, returned to Fort Garry to procure others, leaving Mr. James and his Staff at the "Angle" until I sent them out.

While I was thus employed at Fort Garry all the men, who had been engaged in Canada, belonging to party **M**, came in and insisted on returning home, I had therefore, at the same time, to find others to replace them. This was a work of considerable difficulty but by the 16th December I had procured the requisite number, and arranged with Mr. Jones (sent up by you to attend to Commissariat and other matters at Fort Garry) to forward them to the respective parties.

Leaving Fort Garry on the 17th December, I reached Toronto on the 26th; during my stay at the former place the weather had been extremely cold, the thermometer, on one occasion, registering— 36° in the month of November.

On the 26th February of this year I left Ottawa and ascended the Ottawa River to the mouth of the Montreal, a distance of about 250 miles, taking Mr. Austin and staff with me, to complete the survey of Division **C**, which had been abandoned by the first party sent out, in consequence of some difficulty occurring between the staff and men.

Having seen Mr. Austin's party started, and paid a visit to Mr. Lloyd (**B**), who expected to complete his Division by the middle of April, I returned to Ottawa to superintend the preparation of the Plans, &c., of the work already completed.

A cause of considerable difficulty in carrying out this undertaking, has been the obstacles which prevented either frequent or regular communication between the head office, myself, and the parties on the work; when, however, an opportunity offered, a statement of the progress made with a rough plan and section of the line, has been forwarded to me by the several Engineers.

From the latest information thus received, the following summary of the progress of the work, at the beginning of this month, has been prepared :—

DIVISION B.

On the 31st March, about 15 miles of the survey were unfinished, which the Engineer in charge hoped to finish by the 15th April, if the weather proved favourable.

The first 30 miles of the Division are represented as being quite practicable, but some unfavourable points occur on the remainder. The information obtained, however, warrants the belief that a favourable location can be found by making some deviations from the trial Survey Line.

DIVISION C.

The first party sent out having failed to carry out their instructions, steps have been taken to complete the exploration which, it is expected, will be finished by the month of July.

DIVISION D.

The exploration of this division was completed about the end of January, and the field notes forwarded to this office. The plan and section will be completed in a short time.

A practicable line for a railway has been found, there are, however, a few points where further exploration will be advisable in order to improve the section and render the bridging of two branches of the Moose river, which prove heavy on the first explored line, more favorable.

The length of this division, on the line proposed for the railway is 81 miles.

DIVISION E.

The exploration of this division was completed in February. The Engineer in charge returned to Ottawa within the last few days, having made the journey from Michipicoten on snowshoes where he left the staff at work on the plan and section; they will return to Ottawa by the first boat upon the opening of navigation.

He reports the country favorable for the location of a railway; there will be three rivers, (including the Moose at the starting point) requiring bridges of considerable size, to be crossed.

The section can be improved by taking the line a short distance further

north, which may have to be done for the purpose of avoiding the rough country, found on divisions G. and H. further to the west.

DIVISION F.

When the party left off work, 10th October, in order to reach the last steamer before the close of navigation, 55 miles had been explored, equalling 44½ on the line proposed for the railway.

Letters received (dated in March) from the Engineer in charge of division G. lead to the conclusion that the whole is completed by this time.

The plan and section of the first portion has been plotted and shews a favorable location, which, as in the preceding division, can be improved by moving the line farther north.

DIVISION G.

The exploration of this division was completed early in the winter, and the greater portion of the country traversed found impracticable for a railway.

During the winter the party has been engaged in making a "Flying Exploration" of the country some distance north of last summer's work, the result of this proves that a practicable line can be obtained north of the "height of land."

DIVISION H.

The exploration of this division was completed in October last, at which time the party returned to Ottawa, where the plan and section were plotted.

The country traversed proved entirely impracticable for a railway.

Explorations have been carried on farther north, during the winter, which by the latest accounts received are of a favorable character.

DIVISION I.

Forty miles of this division had been completed when last heard from at the commencement of the winter, and it is expected that the whole will be completed shortly after the opening of navigation.

A portion of the country first explored, between the mouth of the rivers Nepigon and Black Sturgeon, proved very rugged but more recent examinations go to shew that in all probability this can be avoided.

DIVISION K.

The exploration of this division was completed in February.

Letters received from the Engineer represent the country as generally level, full of small lakes, but favorable for the construction of a railway in the required direction.

He is at present at Thunder Bay engaged in preparing the plan and section, which will be forwarded to Ottawa upon the opening of navigation.

DIVISION L.

At the date of the latest letters from the Engineer, 35 miles had been explored. A practicable line found in the general direction indicated by his instructions, although the country is rough and filled with lakes, some of which are of a very considerable size. He has made explorations on both sides of the line and found that a more favorable country exists north of the present location.

DIVISION M.

This division has been completed and the Engineer is engaged in preparing the plan and section at Fort Garry.

He reports favorably of the country traversed, but the first 30 or 40 miles admit of improvement which he thinks can be effected by taking the line farther north.

In order to obtain more information respecting the country lying to the north of the line already explored, a party was sent out about the beginning of this year to make a "Flying Exploration" from Fort Garry to the north end of lake Nepigon.

The report of this expedition will in all probability reach Ottawa soon after the opening of navigation on lake Superior.

DIVISION W.

At the time winter set in and the party returned, 100 miles of this division had been surveyed.

The Engineer (Mr. Murdoch) remained out and made a "Flying Exploration" from the end of the surveyed line as far east as French river.

The portion surveyed (of which a plan and section has been prepared) is quite favorable for a railway, and he reports the other portion as equally so.

In conclusion I may state that, the difficulties which had to be en-

countered, in keeping the various parties supplied with provisions, clothing, &c., throughout the whole of this extensive district, can neither be appreciated nor conceived unless by one who, like myself, has been over the ground.

It is a matter for sincere congratulation that no serious disaster has occurred in carrying out the work, with the exception (already referred to) of the unfortunate loss by fire of seven men.

That such has been the case is, to a large extent, due to the untiring energy and perseverance displayed (with few exceptions) by the Engineers, Staff and Commissariat, who have endured very great hardships in carrying out the work entrusted to them.

I have the honor to be,

Sir,

Your obedt. servt.,

JAMES H. ROWAN.

APPENDIX No. 7.

(Report of Alexander McKenzie, Esq.,—in charge of the Expedition to James Bay.

KINGSTON, 27th Oct., 1871.

SANDFORD FLEMING, Esq., C. E.,
Engineer-in-Chief, C. P. R., Ottawa.

SIR,—The accompanying informal copy of the Itinerary of the Expedition to James' Bay, under my charge, will, when supplemented by the topographical map now in hand, illustrate to you the details of the season's work. You will thereby also learn the nature of the country passed through, as regards its soil, climate, timber, minerals, topographical features, and general geological structure. On all these points I have been as explicit as possible; and my object here is, to epitomize the whole, with the view of lending, if not additional, at least more immediate value to the season's work, by placing it within abstract compass.

According to received instructions, I was charged with carefully examining the country lying between the valley of the Ottawa, Lake Superior, and the waters of Hudson's Bay, with reference to the points above enumerated, commencing at the Montreal River, a tributary of the Ottawa, following the course of the Abbitibbie river, through to James' Bay, and returning by the Moose and Michipicoton river to Lake Superior.

It may hardly be necessary here to state that, in approaching a country so densely wooded, the topographical engineer is liable to some difficulty in obtaining a key, capable of placing within his professional control so vast an area, covering as it does about 30,000 square miles. Aware of this, I first endeavored to direct attention to some leading physical feature, which happily presented itself in the great mountain chain, which, at a depth and altitude more or less irregular, traverses the whole country from Labrador to the far West, and of which as a base the subsidiary triangle enclosed by the Abbitibbie and Moose rivers with the intermediate chain of lakes rests. In ascending the Ottawa river, this well defined chain of mountains follows its north-east bank to the mouth of the Mattawa river the valley of which extends up to Nipissing lake. From Mattawa, the Ottawa leads the voyageur in his upward course in a north-westerly direction for about 80 miles to Matabichwan, where it receives from the south-west the waters of the Montreal and Matabichwan rivers. Below and above this point Temiscamingue lake, through which the waters of the Ottawa flow, extends for a distance of about 70 miles. At about 60 miles up, it leaves the mountain range referred to, in a northerly direction, widens, and becomes shallow at the head, where it receives the waters of

the Ketacumna, Blanch, and Moose rivers, the latter being a continuation of the Ottawa. At its eastern side, and near the head, it also receives the Ottawa river, at present the highest outlet from the lumbering districts enclosed in the bight of the Moose river.

Lying north of this curvilinear range of mountains, and approximately paralled to it, is the great water-shed, which is reached, after ascending the "fifteen" rapids on the Moose river, by the chain of lakes peculiar to it and in which the Abbitibbie and Great Moose rivers take their rise, and which, after flowing northwards, join at "The Mattawa," 20 miles south of the apex of James' Bay, into which, finally, they discharge their party coloured waters. The southern slope is drained by the Michipicoton and other streams which flow southwards through a mountainous and unproductive country into the great lakes, while the St. Lawrence receives the waters of the south eastern slope, through the Ottawa river.

In connection with these general features I may state a fact, which, although well known to yourself, may not generally be understood. In crossing the great water-shed, or "height of land," twice, and on different meridians, I remarked that, both it and the mountain range, each send out antler-like spurs—those of the mountain chain losing themselves in the comparatively level country to the north, while those of the water-shed contain a similar feature, less marked no doubt, but not less real, as indicated by the courses of rivers and streams, and if accurately delineated would produce a most remarkable contour.

As regards general geological features, the country south and south-east of the "height of land," and lying all along those lakes which discharge into the Ottawa and Michipicoton rivers, nearly all, if not all, is primary rock, composed of gneiss, granite, trap, and an undefinable micaceous greenstone, consisting of laminae, more or less irregular in thickness; also, immense quantities of ice drift of every conceivable variety of primary rocks. This greenstone is observable as far north as Abbitibbie lake, its surface invariably denoting the serrating action of former ages. For some distance down the Abbitibbie river, rock of any kind seldom crops out in the banks, except at portages, until, at lat $48^{\circ} 44' 43''$ N., primary rock and Abbitibbie clay give place to small but increasing quantities of magnesium limestone, which, with large quantities of gypsum, appears to underlie the whole country to the north-west of this point, on the Abbitibbie river, and to extend over an indefinite area north-west of the Moose river. Since my return I have given the details of this latter formation much study and reflection; but I consider it would be rash to attempt to deliver any decided opinion on a question involving so much, until after consultation (as kindly suggested by you) with some eminent Geologist.

The highest lumbering districts observable on the Ottawa, terminate at *Lac des Quinze*, at the head of the "Fifteen Rapids;" from which point, and up to the "height of land," the white pine gradually disappears, and is replaced with spruce, red pine, birch and poplar. On, and beyond the

Watershed, the forest is principally composed of spruce, poplar, white birch, and cedar. It is notable however, that in all this portion of the Hudson's Bay territories, the spruce is gradually giving place to the poplar, which no doubt indicates some change, local or general, on which it would be useless here to speculate. The woods there are also very dense, and vary in weight of growth according to the quality and nature of the soil, which, although generally light is of fair quality, especially that resting on the limestone foundation referred to. As a general rule the "height of land" and vicinity, as well as south of it, particularly in the Lake Superior region, contain land of indifferent, although varied quality. This is especially the case in the Abbitibbie district, which rests on a species of light blue clay, which when dried, resembles common pipe-clay, and which imparts a white color to its lake and river for 300 miles to the sea. I found also that this clay in minute drift, forms the sub-strata of the alluvial islands (about 27 in number) dotting the mouth of the Moose river, and, which the flow and ebb of the tide gives an excellent opportunity of observing. Above "the Mattawa," it is also perceivable to some slight extent in the banks of the Moose river, but disappears about 45 miles from the sea, and about 35 miles below the north-eastern margin of the primary formation, or, what appears to be the ancient sea wall.

The principal rivers north of the great Watershed are shallow, and not available for heavy craft. The Moose and Abbitibbie rivers, however, admit of navigation by the Hudson's Bay Company's boats, of about 10 tons, for nearly 100 miles up, but only during spring, and sometimes up till the 1st of July. The Abbitibbie is remarkable for the regularity of its width, and also for the singularly definite nature of its traverse angles, as well as for the uniform length of its traverse course while its descent is characterized by a series of rapids, (34 in number) the last and most dangerous of which occurs at its junction with the Moose river. On the other hand, the Moose is comparatively straight, but irregular in its width for sixty miles from the sea, and has no portage for 120 miles up, being a gradual current; after which it becomes in most places, up to the line of the Canadian Pacific Railroad survey very serpentine. For variety of rock especially below New Brunswick House, both at portages and in drift, it surpasses anything conceivable. Its quartz is pure and almost endless in quantity, containing apparent traces of gold, copper, &c., while galena is to be found in its "south branch." There are also what appears to me indications of petroleum on its western side for about 80 miles southwards from tide mark; this locality also abounds with ferruginous and brackish springs.

Following up the Moose river to Lat. $48^{\circ} 44' 30''$ N., where it is crossed by the Pacific Railroad survey now in progress, the general country is very regular and offers every facility for *roads* and *railroads*; immediately south of this, however, the undulations peculiar to the "height of land" are in some places still perceptible. Advancing southwards towards Lake Superior, the landscape becomes thickly interspersed with rock, mountain, and lake, till in descending the Michipicoton river, primary rock and a barren sandy soil are met with.

It is not my wish here to introduce any question relative to an isothermal line; but the presumption is, that, were the country explored this season, under cultivation, a condition only precluded by its vast extent, and absence of communication, its climate would unless in certain localities, from local causes, differ little from the lower cultivated portions of the Province of Quebec, an evidence of which exists in the crops raised under the present unfavourable circumstances at the Hudson's Bay Company's Posts, north of the great Watershed. At Moose Factory the extremes of temperature are -40° in winter and $+89^{\circ}$ in summer, the average during the coldest month being so far as I could learn, about $+11^{\circ}$, or a little colder than at Abbitibbie, where I procured my figures from the register kept for the Smithsonian Institution. The climate of the country is very healthy, and even in the heat of summer, the air highly invigorating, but early frosts frequently prevent grain from ripening properly, especially at Moose Factory, where the soil is rich alluvial, and the crops over luxuriant for an early harvest. At New Brunswick House, however, situated about $49^{\circ} 8' N.$ latitude, I procured a very fair specimen of ripe barley.

On Moose Island, in Lat. $51^{\circ} 14' 43'' N.$, the magnetic variation is $13^{\circ} W.$ and I observed from the Hudson's Bay Company's chart of 1821, that following the meridian of $80^{\circ} W.$ Long. at Lat. $52^{\circ} 10' N.$ it is $7^{\circ} W.$ at $52^{\circ} 40' N.$ it is $8^{\circ} W.$, while at Lat. $54^{\circ} 18' N.$ and Long. $80^{\circ} 30' W.$ it is $10^{\circ} W.$ I had no means at my command this season, of ascertaining whether observations taken this year would correspond with those of fifty years ago. In the soundings, so far as I was able to examine during a short trip of three days in James Bay, there seems in general little difference between those taken then and in 1821; that little however indicates a slitting up, but the bottom is free from rocks, except a few drift boulders, and the anchorage excellent.

Along our route of exploration we met with some very beautiful and interesting scenery, especially on the Abbitibbie river, of which I made some pencil sketches. On reaching Moose Factory, however, I found from Mr. J. L. Cotter, Accountant, Southern Department that, during his summer travels in Hudson Bay, he had, as an amateur, photographed many of the principal scenes we had passed; at the same time presenting me with what copies he had, including a complete view of Moose Island and Factory.

In my contact with the Indians, I have been far more successful than I anticipated in securing their good opinion, three of them having, as bowsman, steersman, and cook, followed us faithfully throughout the entire expedition. The Cree-speaking Indians had become very suspicious of the future in consequence of the transition state of the Company. In answer to many inquiries, which I had neither power nor authority to answer, I constantly assured them that the object and wish of the Canadian Government was to deal fairly by them; also taking care never to leave a post or encampment, before ascertaining to what extent our presence and conduct had met their approval.

It would be unjust to close this report without expressing my satisfaction with my assistants. To their exertions and intelligence, the rapidity of our movements, and the success of the expedition owes much. From the Hudson's Bay officers, in addition to much information and help, we met with much personal kindness.

I have in hand a statement of the accounts of the expedition which will be submitted at the earliest opportunity.

All of which is respectfully submitted by

Sir, your most obedient servant,

A. McKENZIE,

Engineer in charge of Division N

APPENDIX No. 8.

Explanations by the Engineer in Chief respecting the commencement of the Survey at Mattawa.

CANADIAN PACIFIC RAILWAY,

Office of the Engineer in Chief,

Ottawa, May 6, 1872.

THE HON. H. L. LANGEVIN, C. B.,

Minister of Public Works, &c., &c.

SIR,—Objections have been offered, since my Report on the Pacific Railway Exploration was made public, to the point selected for beginning the easterly end of the survey. It is therefore proper that I should submit a few words of explanation, which if you deem expedient, may be included in the appendices to the original report and printed with them.

In the selection of a point for beginning the survey, three main objects had to be kept in view :—

1st. A connection with the Railways of the Province of Ontario.

2nd. A connection with the Railways of the Province of Quebec.

3rd. The discovery of a practicable line for a Railway through the wilderness country extending northerly and westerly by Lake Superior to Manitoba.

The Government considered that a point between the Georgian Bay and the river Ottawa in the latitude of Lake Nipissing, would generally meet the first two objects, viz.:—the connection with the existing Railway System of the country.

The third object appeared, at the time the survey began, the one of chief importance, as grave doubts were entertained by many as to the possibility of piercing the long extent of rugged country, believed to exist, with a practicable line for the Railway.

The Government was extremely anxious that a practicable line should be discovered, with as little delay as possible, and in order the more effectually to accomplish this object, the Engineer appointed to conduct the surveys was left untrammelled as to the course to be pursued.

The Government simply decided that the survey should begin in the latitude of Lake Nipissing somewhere between the Georgian Bay and the river Ottawa; the duty and responsibility of finding a practicable line thence westerly devolved upon me.

The distance between the Georgian Bay and the river Ottawa, in the latitude referred to, is in round figures about 100 miles. Lake Nipissing is situated about midway and with its different bays, practically occupies about 50 miles; or about half the whole distance

It was clear that a line for the Pacific Railway, to connect with the Railways of Canada to the south, must pass either to the east or to the west of Lake Nipissing.

Every known source of information respecting the country lying between Lake Nipissing and the northern bend of Lake Superior was fully and carefully consulted by me and all accounts agreed as to the exceeding roughness and impracticability of the country for Railway construction on a line drawn from any point between the Georgian Bay and the west end of Lake Nipissing.

The country on a line drawn up the valley of the Ottawa from a point east of Lake Nipissing, seemed on the other hand much more promising.

I satisfied myself that to attempt the discovery of a favorable line on a moderately direct course from the westerly end of Lake Nipissing to the north side of Lake Superior could only be made at a great expenditure of time and money, and without much hope of success.

My duty and object was not to court failure but to aim at success by the most direct course, I therefore decided to look for a satisfactory solution to the problem of practicability, by beginning the survey at a point east of Lake Nipissing.

The importance of bringing the Pacific Railway as near as practicable

to the system of Railways converging at Toronto, without going too much out of the direct course to the seaboard is fully recognised. In relation to this point, I wish to draw attention to certain facts which will probably set some misapprehensions at rest.

Lake Nipissing is situated directly north of Toronto. The Northern Railway, the Nipissing Railway, the Whitby, Bowmanville, Port Hope and Cobourg Railways with their extensions, as now projected, lead to a point in the Muskoka District named Bracebridge. Bracebridge is due South of and actually nearer the East end of Lake Nipissing than the West end.

It seems clear therefore that if a point to the East of Lake Nipissing be found not more distant from Fort Garry than a point on the West side of this Lake, the most direct connection between Fort Garry and the Railways of Ontario would be by the East side of Lake Nipissing.

I am perfectly satisfied from all the information acquired respecting the geographical position of the different points referred to and the physical features of the intervening country that the probability of finding a more favorable and shorter line, by the West side than by the East side of Lake Nipissing is very small.

Be this as it may, I trust the explanations given with regard to the commencement of the survey are satisfactory. Of course in beginning instrumental examinations, it was necessary to fix on some definite point. I selected Mattawa as this point for similar reasons to those which governed me in making the survey East instead of West of Lake Nipissing.

I do not, however, wish it to be understood that I consider it impracticable to build the Railway nearer the East end of Lake Nipissing than Mattawa and thence to such point south of it as the Government may select.

I have the honor to be,

Sir,

Your obedient servt.,

SANFORD FLEMING, Engineer-in-chief.

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